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Report to Congress on Injection of Hazardous Waste

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16. ABSTRACT

In response to a directive from Congress, expressed in Section 701 of the Hazardous and Solid Waste Amendments of 1984, EPA obtained information on the engineering, hydrological, regulatory and waste characteristics of hazardous waste injection wells. Some of the general characteristics found were:

- o There were 252 wells in 112 facilities of which 195 in 90 facilities were active in 1984;
- o The injected volume of 181 wells which were active in 1983 was estimated at 11.5 billion gallons.
- o Most of the injection occurs in the Gulf Coast and the Great Lakes Area.

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REPORT TO CONGRESS ON INJECTION OF HAZARDOUS WASTE

Office of Drinking Water
U. S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

2<

REPORT TO CONGRESS ON INJECTION OF HAZARDOUS WASTE - ERRATA SHEET
As of 8/23/85

° Page II-2 - Paragraph after bullets

The number 193 should be 195.*

° Page II-4 - Right-hand column of "Operating Status of Class I.."

- The fourth set of numbers should be 2/2 instead of 4/3 (Californi
- The fifth set of numbers should be 2/2 instead of 1/1 (Colorado).
- The eighteenth set of numbers should be 81/31 instead of 79/31 (T

° Page VI-18 - Third paragraph, second sentence

- Five should replace four.

° Section 1 of the attachments

- Partial and total counts should be disregarded**

° Section 6 of the attachments

- Six wells that did not inject in 1983 were included:
  . Wells OB5, I6, 17A and OB4 at the Hercofina facility in NC;
  . Well 1 at the Cominco America Inc. facility in TX;
  . Well 1 at the Monsanto Chemical Co., Chocolate Bajou facility in TX; and
  . Well 1 at the Waste-water Inc. facility in TX.

° Last attachment - "Location and Status of Class IV Wells"

- The order of the first and second page is inverted.*
- Inadvertently two Class IV wells were left out. These two wells are located in California at the Cordova Chemical, Aerojet Propulsion Laboratory Facility. They are CERCLA clean-up wells and authorized in the UIC regulations.

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* Corrected in prints after June 12, 1985
** Corrected in prints after July 15, 1985

Foreword

This report was prepared by the Office of Drinking Water from data gathered by the EPA Regional Offices and a contractor. Analysis of the data and writing of the report was done by staff of the Underground Injection Control Branch of the Office of Drinking Water. The texts of the field reports were prepared by the EPA Regional Offices after visits to the 20 sites and reviews of State files. The original Project Manager was Dr. Jentai Yang who organized the effort and was responsible for the first drafts of the document. The project was completed by Mario Salazar.

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Report to Congress on the Injection of Hazardous Waste

Table of Contents

Page

I. Background - History

1.1 Introduction I-1
1.2 The Underground Injection Control (UIC) Program I-1
1.3 Hazardous Waste Well Assessment and Inventory I-3
  1.3.1 Need for the Assessment & Inventory I-3
  1.3.2 Methodology I-5

II. General Findings

2.1 Introduction II-1
2.2 Well Operating Status II-1
2.3 Volume Injected II-2
2.4 Well Classes II-2
2.5 Type of Operation II-6
2.6 Geographic Distribution II-6
2.7 Age of Wells II-10
2.8 Users of HW Wells II-10
2.9 Surface Facilities II-14

III. Hydrogeologic Environment

3.1 Introduction III-1
  3.1.1 Geohydrologic Considerations III-1
  3.1.2 General Geology III-1
3.2 Regional Geological Findings III-1
3.3 Local Geological Findings III-2
  3.3.1 Lithological III-2
  3.3.2 Structural III-7
3.4 Hydrology III-7
3.5 Other Considerations III-13
  3.5.1 Formation Fluid Considerations and Compatibility III-13
  3.5.2 Water Supply Wells III-16
  3.5.3 Wells in the Area of Review III-16

IV. Well Construction and Evaluation

4.1 Drilling Technology IV-1
4.2 Well Construction Techniques IV-1
  4.2.1 Bottom-Hole and Injection Completion IV-1
  4.2.2 Casing, Tubing and Packer IV-6
  4.2.3 Cementing IV-12
4.3 Corrosion Control IV-14
4.4 Mechancial Integrity of Injection Wells IV-15
  4.4.1 Requirements IV-15
  4.4.2 Findings IV-16

V. Waste Characteristics

5.1 Introduction V-1
5.2 Waste Classification V-1
5.3 Distribution of Waste Types V-2
5.4 Concentration of Waste Stream Components V-2
5.5 Distribution by Waste Codes V-7
5.6 Section 201(f) of the Hazardous and Solid Waste Amendments V-7
5.7 Section 201(g) of the HSWA V-9
5.8 Off-Site Operations V-9

VI. Regulatory Controls

6.1 Introduction VI-1
6.2 Hazardous Waste Management Program VI-1
6.3 Natural Pollutant Discharge Elimination System (NPDES) VI-2
  6.3.1 Limitation of the NPDES Program VI-2
  6.3.2 NPDES Permits VI-5
6.4 The Underground Injection Control (UIC) Program VI-6
  6.4.1 Requirements for Class I Hazardous Waste Wells VI-7
6.5 UIC Permits VI-8
  6.5.1 UIC Operation Requirements VI-9
  6.5.2 Monitoring VI-12
  6.5.3 Reporting VI-14
6.6 Inspection and Surveillance VI-15
6.7 Noncompliance and Enforcement VI-17
6.8 Financial Responsibility VI-21
6.9 Class IV Wells VI-28

APPENDICES

List of Figures

Figure #		Page
I - 1	Location of Class I Hazardous Waste Facilities	I - 9
II - 1	Operational Status of HW Wells	II - 3
II - 2	Active On-Site / Off-Site Wells	II - 8
II - 3	Distribution of Active Hazardous Waste Injection Wells	II - 9
II - 4	Hazardous Waste Wells Built Per Year	II - 11
II - 5	Industries Using HW Injection Wells	II - 12
II - 6	Surface Facilities at HW Injection Sites	II - 13
III - 1	Regional Geological Features in the U.S.	III- 3
III - 2	Injection Zone Lithologies	III- 5
III - 3	Confining Zone Lithologies	III- 6
III - 4	Average Depths: IZ, USDW, Separation	III- 12
III - 5	Wells in the Vicinity of Class I HW Wells	III- 19
IV - 1	Components of a Rotary Drilling Operation	IV - 2
IV - 2	Injection Well with Open Hole Completion	IV - 3
IV - 3	Injection Well with Screened Bottom	IV - 4
IV - 4	Injection Well with Perforated Bottom	IV - 5
IV - 5	Well Completions	IV - 7
IV - 6	Schematic Showing Well Construction Steps	IV - 8
IV - 7	Well Construction Materials	IV - 11
IV - 8	Injection Well with Open Annulus Completion	IV - 13
IV - 9	Schematic Diagram Showing Injection Well with Lack of Mechanical Integrity	IV - 17
V - 1	Breakdown of the Undiluted Waste-Hazardous and Non-Hazardous	V - 4
V - 2	Breakdown of the Non-Aqueous Hazardous Waste	V - 5
VI - 1	Class I HW Injection Permits Issued	VI - 4
VI - 2	Status of UIC Permits	VI - 10
VI - 3	Comparison of bottom hole pressures	VI - 11
VI - 4	Compliance and Enforcement	VI - 19

List of Tables

Table #		Page
I - 1	List of Class I Hazardous Waste Injection Facilities Assessed	I - 7
I - 2	Representativeness of Assessed Facilities	I - 10
I - 3	Outline of Class I Hazardous Waste Injection Facility Report	I - 12
I - 4	Hazardous Waste Injection Wells-Quality of Data Collected	I - 13
II - 1	Operating Status of Class I Hazardous Waste Wells Facilities in the U.S. (August 1984)	II - 4
II - 2	Estimated Volume of Hazardous Waste Injection in the U.S. 1983	II - 5
II - 3	Off-Site Wells and Facilities in each State	II - 7
II - 4	Distribution by Industrial Category	II - 15
III- 1	Injection Zone Characteristics	III- 8
III- 2	Confining Zone Characteristics	III- 10
III- 3	USDW in the Vicinity of Class I HW Wells	III- 11
III- 4	Common Water Analyses Performed on Subsurface Water Samples	III- 15
III- 5	Wells in the Vicinity of Class I HW Wells	III- 17
IV - 1	Tests to be Considered During Construction	IV - 18
IV - 2	Acceptable Test to Prove Mechanical Integrity Perdiodically	IV - 19
IV - 3	Applicability of Tests That May Be Used For Mechancial Integrity Verification	IV - 20
IV - 4	MIT Performed in Facilities Visited	IV - 22
V - 1	Waste Characteristics of 108 HW Active HW Wells in the U.S. in 1983	V - 3
V - 2	Hazardous Waste Stream Components and Concentration	V - 6
V - 3	Eleven Most Frequently Encountered RCRA Codes	V - 8
V - 4	Facilities Injecting RCRA Codes F001 to F005	V - 10
V - 5	Wells Injecting Acids With pH less than 2 (1983)	V - 11
V - 6	Calculated Annual Volume Injecting into Active Off-site Wells	V - 13
VI - 1	Summary of State Permitting Programs	VI - 3
VI - 2	EPA Implemented Program (DI-I) 5/11/84	VI - 7
VI - 3	Non-Compliance Episodes at Off-site Facilities	VI - 22
VI - 4	Non-Compliance Episodes at On-site Facilities	VI - 23

EXECUTIVE SUMMARY

INTRODUCTION

This report was prepared to meet the requirements of Section 701 of the Hazardous and Solid Waste Amendments of 1984. This Section requires that:

> "(a) The Administrator, in cooperation with the States, shall compile and, not later than 6 months after the date of enactment of the Hazardous and Solid Waste Amendments of 1984, submit to the Committee on Environment and Public Works of the United States Senate and the Committee on Energy and Commerce of the United States House of Representatives an inventory of all wells in the United States which inject hazardous waste [hazardous wastes are designated as such under the provisions of 40 CFR Part 261 of the Resource Conservation and Recovery Act of 1976]. The inventory shall include the following information:
>
> "(1) the location and depth of each well;
>
> "(2) engineering and construction details of each well, including the thickness and composition of its casing, the width and content of the annulus, and pump pressure and capacity;
>
> "(3) the hydrogeological characteristics of the overlying and underlying strata, as well as that into which the waste is injected;
>
> "(4) the location and size of all drinking water aquifers penetrated by the well, or within a one-mile radius of the well or within 200 feet below the well injection point;
>
> "(5) the location, capacity, and population served by each well providing drinking or irrigation water which is within a five-mile radius of the injection well;
>
> "(6) the nature and volume of the waste during the one-year period immediately preceding the date of the report;
>
> "(7) the dates and nature of the inspections of the injection well conducted by independent third parties or agents of State, Federal, or local government;

"(8) the name and address of all owners and operators of the well and any disposal facility associated with it;

"(9) the identification of all wells at which enforcement actions have been initiated under this Act (by reason of well failure, operator error, groundwater contamination, or for other reasons) and an identification of the wastes involved in such enforcement actions; and

"(10) such other information as the Administrator may, at his discretion, deem necessary to define the scope and nature of hazardous waste disposal in the United States through underground injection.

"(b) In fulfilling the requirements of paragraphs (3) through (5) of subsection (a), the Administrator need only submit such information as can be obtained from currently existing State records and from site visits to at least 20 facilities containing wells which inject hazardous waste."

The report summarizes the raw data and is organized along the following lines:

- A General information chapter contains information required by paragraphs 1, 8 and 10;
- A chapter on Engineering covers the construction of the wells and the information in paragraphs 2 and 6;
- The chapter on Hydrogeology covers paragraphs 3, 4 and 5;
- Information required by paragraph 6 is covered under Waste Characteristics; and
- A chapter on Regulatory Controls covers paragraphs 7 and 9.

The raw data containing the information requested in paragraphs 1 through 10 of Section 701(a) is attached as an appendix. Field reports from the 20 facilities visited are available and may be obtained by contacting the Project Manager, Mr. Mario Salazar, in the Office of Drinking Water, U.S. EPA, or through the appropriate Regional office. A list of these facilities appears in Chapter I.

BACKGROUND

Disposal of waste by underground injection started in the oil fields in the thirties as an alternative to surface disposal of produced brines. Disposal of industrial wastes in injection wells started in the fifties. It was considered a method to isolate wastes (that could not be easily treated) from the accessible environment by placing them into deep formations where they would remain for geologic time.

The practice was premised on simple hydrogeologic principles. In several areas of the United States, the basement rock is covered by up to 20,000 feet of sedimentary rocks, which have been deposited over millions of years and have remained relatively undisturbed. These rocks are stratified, and the many layers vary with regard to composition, structure, permeability, and porosity both vertically and laterally. They also contain water whose composition changes with depth. Generally, the concentration of total dissolved solids (TDS), increases with depth. Usually water is considered potable when it contains less than 500 mg/l TDS, while the upper limit for irrigation and stock watering is 2,500 to 3,000 mg/l TDS. (EPA protects water with a TDS content of 10,000 mg/l or less since there is evidence that this water can be used as a potable source after treatment.) By way of comparison, brines associated with oil and gas production generally contain 30,000 to 100,000 mg/l TDS, and seawater generally contains 35,000 mg/l TDS. The fact that there are these large differences between the composition of surficial and deep water indicates that the various impermeable strata act as barriers to the upward movement of the deep saline water. It is sedimentary rocks with sufficient permeability, thickness, depth and areal extent which best serve as injection zones. The location of such thick sedimentary sequences (in the Gulf Coast and Michigan Basin, for instance) is one of the factors controlling where deep well injection can occur.

The engineering of injection wells was based on oil-field technology and was developed further by major companies to dispose of their specific waste streams. A typical injection well is several thousand feet deep and injects wastes into highly saline permeable injection zones. The well consists of concentric pipes (figure 1). The outer pipe or surface casing usually extends below the base of usable water and is cemented back to the surface. Two pipes extend to the injection zone, the long string casing which is also usually cemented back to the surface, and within it the injection tubing. It is through the tubing and perforations at the bottom of the long-string casing that waste is injected. The space between the tubing and the casing (called the annulus) is closed off at the bottom by a device called a packer, which keeps injected

11

Ideal Injection Well and Site

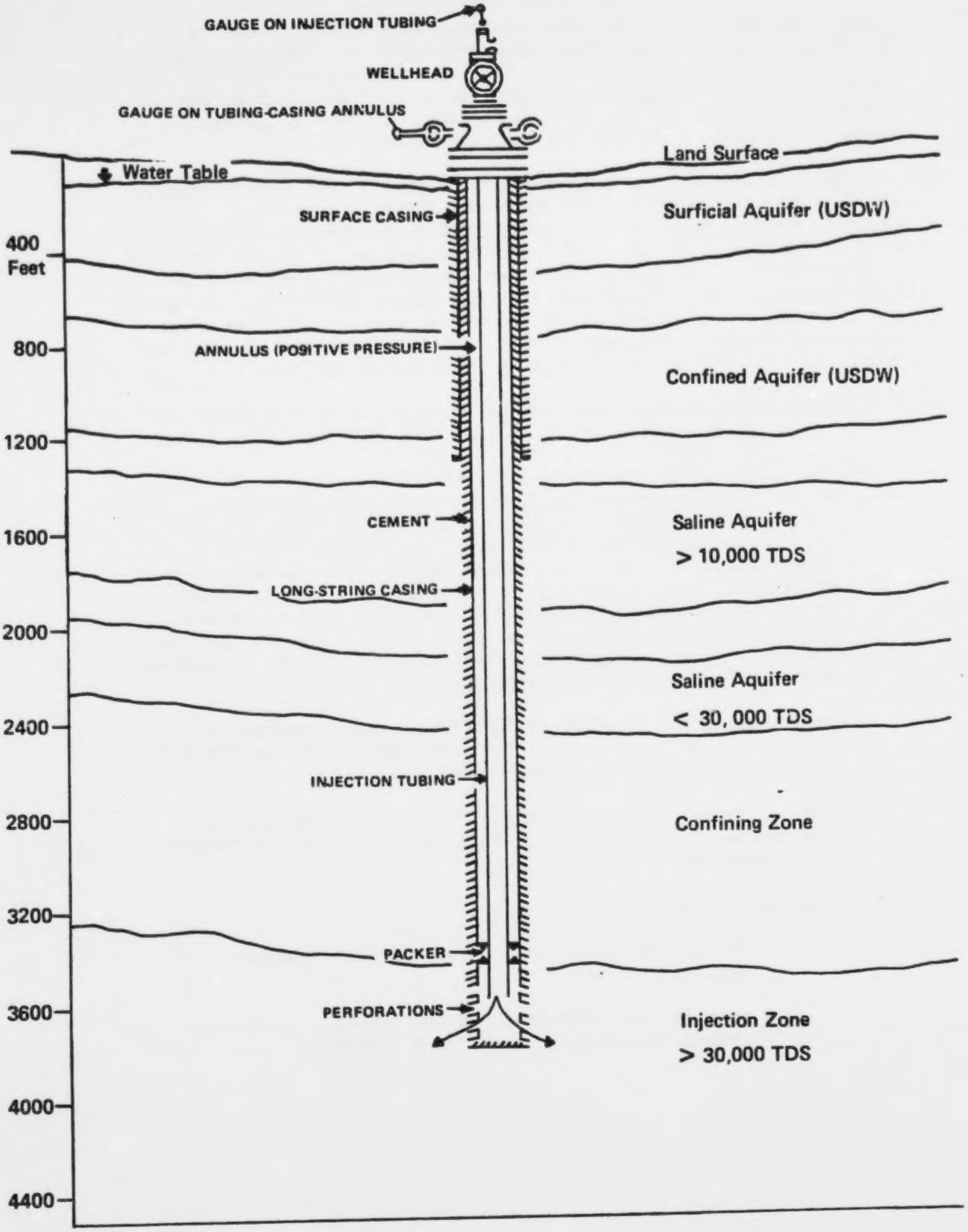
GAUGE ON INJECTION TUBING
WELLHEAD
GAUGE ON TUBING-CASING ANNULUS
Land Surface
Water Table
Surficial Aquifer (USDW)
SURFACE CASING
400
Feet
800
ANNULUS (POSITIVE PRESSURE)
Confined Aquifer (USDW)
1200
CEMENT
1600
Saline Aquifer
> 10,000 TDS
LONG-STRING CASING
2000
Saline Aquifer
< 30,000 TDS
2400
INJECTION TUBING
2800
Confining Zone
3200
PACKER
3600
PERFORATIONS
Injection Zone
> 30,000 TDS
4000
4400

Figure 1

fluids from backing up into the annulus. This annular space is typically filled with an inert, pressurized fluid. The inert fluid is kept at a higher pressure than the injection pressure in the tubing to prevent escape of the waste into the annulus if a leak should occur. Capping the well is the wellhead, which contains valves and gauges to control and monitor injection.

The practice of underground injection came under Federal control in 1974 when the Safe Drinking Water Act (SDWA) was enacted. In order to ensure the protection of the Nation's underground sources of drinking water (USDWs) from improper injection of fluids, Congress established the Underground Injection Control (UIC) program in Part C of the Act. The law required that the Agency set minimum standards and technical requirements which the States were to adopt in order to assume primary enforcement responsibility (primacy). The salient points of the regulations adopted in 1980 are as follows:

- They define underground sources of drinking water (USDWs) as all aquifers containing water with less than 10,000 mg/l TDS.

- They categorize injection wells into five classes. Class I wells inject hazardous and non-hazardous waste below the deepest USDW. Class II wells are used in conjunction with oil and gas production and include the vast majority of injection wells. Class III wells are used for the extraction of minerals in solution mining operations. Class IV wells inject hazardous wastes into or above USDWs and are banned. Class V wells are nonhazardous waste injection wells that do not fit into the other four classifications. Class I hazardous waste wells are the focus of this study.

- They adopt the definition of hazardous waste promulgated in 40 CFR Part 261, pursuant to the requirements of the Resource Conservation and Recovery Act (RCRA).

- They establish minimum technical requirements designed to ensure that the waste will be injected in the proper horizon and remain there.

These requirements include:

- siting (in areas free of faults, with adequate confining zones);

- construction (requirements for casings, tubing and packer, cementing, logging and testing);

- operation (fracturing of the injection zone is prohibited);
- monitoring (including periodic testing of the integrity of the well) and reporting; and
- plugging and abandonment (including financial responsibility demonstration).

For a State to have a Federally approved UIC program, it must meet these minimum regulatory standards. Proper oversight by EPA guarantees that these standards are implemented. Where EPA implements the UIC program in a State, the Agency has to follow these same minimum standards. As of March 18, 1985, 32 States1/ had primacy for Class I wells, and EPA has started to implement the program in 25 States.

In response to Congressional and Agency preliminary directives, the Office of Drinking Water in 1983 began examining Class I wells which inject hazardous wastes. During August and September of 1983, a task force with participants from EPA Headquarters and the Regions visited 20 hazardous waste injection facilities with 59 wells and obtained detailed information on surrounding ground-water usage, wastes injected and the regulatory controls applied to these wells. In addition, information on the rest of the existing Class I hazardous waste injection facilities was obtained from State and EPA records by EPA Regional personnel and a contractor. Questionable information was verified by contacting the companies and asking for a voluntary review of the data originally obtained from EPA and State files. Response to the verification effort was approximately 70% (68 responses out of 94 requests).

RESULTS OF THE INVENTORY

Nationwide, this inventory has identified 112 facilities which inject hazardous wastes through 252 Class I wells. Ninety of these facilities were active and injected hazardous waste into 195 wells during 1984 (only 181 wells were operating in 1983). The other 57 wells (out of the 252 total) were inactive. Of the 195 active wells, 152 operated continuously and 43 intermittently. Of the 57 inactive wells, 41 were abandoned, 3 were shut-in or in the process of changing type of operation, and 13 had a permit pending or were under construction.

1/ "States" are defined in the SDWA as the 50 States, District of Columbia, Puerto Rico, Virgin Islands, Guam, Samoa, Trust Territories and Northern Marianas.

14<

Active hazardous waste injection wells are found in fifteen States. The vast majority of the wells are located along the Gulf Coast and near the Great Lakes. Louisiana and Texas alone account for 66% of the wells. Other States with sizeable numbers of hazardous waste wells are Michigan, Indiana, Ohio, Illinois, and Oklahoma. These two areas, the Gulf Coast and Great Lakes regions, have similar historical and geological backgrounds. Historically, these States have had experience in underground injection due mainly to oil and gas related activities, which have provided abundant data on deep formations. Geologically, formations in these States are amenable to efficient injection. Another common characteristic, though not exclusive to these two regions, is that both are highly industrialized.

Most of the wells were drilled between the mid-1960's and the mid-1970's. There has been no significant increase in the rate of construction of new wells since 1980.

The biggest user of Class I HW wells is the chemical industry. Manufacturers of organic chemicals account for 44.1% of the wells and 50.8% of the volume. The petroleum refining industry accounts for 20% of the wells and 25% of the volume. Other chemical manufacturers (agricultural, inorganic and miscellaneous) account for 17.5% of the wells and 12.6% of the volume. The metals and minerals industry accounts for 8.2% of the wells and 5.8% of the volume. The aerospace industry accounts for 1% of the wells and 1.5% of the volume.

Only 4.4% of the total injected volume is handled by commercial waste disposers with 9.2% of the wells (18 wells at 13 facilities). They are classified as "off-site wells" because they inject hazardous waste which has been generated at other locations. The waste must be accompanied by a manifest under RCRA.

Hydrogeology

Nationwide, most of the HW injection wells (76%) inject into sand and sandstone formations, 14.3% inject into limestones or dolomites, and the remainder in shaley sandstones (9.7%). In all cases, the injection formations are unusable as potential future mineral resources or as potable water sources. Many (42.7%) of the confining zone lithologies are shale, followed by shaley sandstone (20.8%), shaley limestone (10.0%), and other (26.5%).

The average depth of all hazardous waste injection wells from the ground surface down to the top of the injection zone was found to be 4,063 feet. The depth from the ground surface to the bottom of aquifers containing water with 10,000 mg/l TDS averaged 1,179 feet. There is an average separation between injection zones and USDWs of approximately 2,925 feet.

Some information on the location and names of all water well owners within a five-mile radius of injection wells was obtained, although the information was not complete because it is not regularly required by State agencies in reviewing well permit applications and so is not readily available. Much of the information was obtained indirectly, for example, by identifying residences on a county map. The number of known water wells within a five-mile radius of the facilities visited varied from 1 to 2,764 wells.

Engineering

Information on the engineering characteristics of HW injection wells was relatively complete because the States usually require very specific information on the design and construction of the wells before a permit is issued. Information was received on 99% of the HW wells.

Casings: All of the wells were found to have at least two casing strings and 46% have three strings. Decisions concerning the selection of the casing depend on the hydraulic loading of the well, internal and external pressures, axial loading (tension and compression), temperatures, and corrosion action of the environment. In over half the wells the material used for casing is steel with a yield strength of 55,000 psi (J-55). Other materials used are J-80 steel, fiberglass, fibercast, stainless steel and others.

In every case, the wells are cemented from the surface to below the base of the lowermost USDW and from the injection zone trough the overlying confining zone. In addition, 88% of the wells are cemented for their entire length in at least one string.

Tubing: The materials used in 94% of the wells were designed to be resistant to corrosion caused by the injection fluid. There is no information available on the remaining 6%. Tubing materials found were: steel 66%, fiberglass 13%, fibercast 10%, stainless steel 5% and unreported 6%.

Annulus and Packer: Mechanical packers were found in 93% of the wells and fluid seals in 7%. Fluid seals isolate the annulus by maintaining a line of equal and opposite pressure between the injection and annulus fluids.

Mechanical Integrity Tests and Monitoring

For most wells, continuous monitoring of the volume and the injection and annulus pressure provides information as to the operation of wells. However, other tests are required before injection begins and every five years thereafter to confirm the integrity of wells. These tests are generically known as "mechanical integrity tests" (MITs). Every HW well visited had been tested for mechanical integrity prior to beginning operation to evaluate the soundness of the tubular goods (casing, tubing, and packer). However, not all of the wells had been tested to evaluate the soundness of the cementing job. Approximately 23% of the active injection wells have been repermitted. The MITs, in States which have started to repermit wells, have uncovered a few shortcomings which could have potentially threatened USDWs. These shortcomings have been or will be corrected before any damage is done to USDWs. Thus, the MIT requirement is proving to be an excellent tool in identifying a large number of mechanical defects and preventing contamination of USDWs.

There are only a few HW injection facilities at which deep aquifers are monitored since such wells become another possible pathway for undesired upward migration, are difficult to site and are very expensive to construct. At most of the facilities, monitoring is only done on surficial aquifers that can be affected by surface facilities associated with the injection wells.

Waste Characteristics

Information on both waste concentration and volume was obtained for 108 of 181 active Class I wells injecting hazardous wastes during 1983. During 1983 the 108 wells disposed of a total of 6.2 billion gallons of wastes, composed of roughly 5.9 billion gallons of water in which 228 million gallons of wastes were diluted. Extrapolating from the data on the 108 wells to the total number of active wells, out of the 11.5 billion gallons estimated to have been injected in 1983, 423 million gallons were actual wastes while the remainder was water. Of these 423 million gallons, it is estimated that 48% (203 million gallons) are hazardous compounds. Even though hazardous waste constituents only account for 1.77% of the total volume, under the RCRA definition, the whole volume (11.5 billion gallons) is considered hazardous.

In this report, hazardous wastes are categorized as either acids, organics, heavy metals, hazardous inorganics, or "other." Acids may be either inorganic or organic liquids with a pH equal to or less than 2.0. Heavy metals injected include chromium, copper and nickel, and hazardous inorganics include selenium and cyanide. Organics consist of those injected compounds which contained carbon. The "other" category includes waste reported as chemical oxygen demand (COD), biochemical oxygen demand (BOD) and total suspended solids (TSS) which because of the lack of specific data were assumed to be hazardous. Acids and organics were the prevalent wastes by volume, accounting for 41% and 36% respectively of the non-aqueous hazardous components. Heavy metals account for 1.39%, hazardous inorganics for .08%, and "other" for 20.99%.

The Hazardous and Solid Waste Amendments of 1984 in Section 201(f) are particularly concerned with the disposal of solvents (RCRA codes F001, F002, F003, F004 and F005), and dioxin-containing compounds (RCRA codes F020, F021, F022 and F023). Hazardous waste codes were obtained for wastes from 89 active wells. In general, the information was sketchy. Complete data (both RCRA codes and the amount injected) were available for only 51 of the wells. From the information obtained, only eight well operators reported disposing of the solvents. No wells were reported to have been injecting dioxin-containing compounds.

The Amendments are also concerned with the disposal of the wastes included in the "California list" (Section 201 (d)). The only wastes on this list found to be injected were hazardous wastes with a pH less than or equal to 2.0, and nickel in a concentration greater than 134 mg/l. Of the 181 wells which reported information on pH, 25% (35 wells) reported injecting acids with pH $\leq$ 2, and one well was injecting nickel with a concentration of 600 mg/l.

Enforcement actions

The information on non-compliance was obtained from the surveillance records of the States, but these records do not report whether the cases were investigated under a Federally mandated UIC program or prior to this. A total of 84 noncompliance incidents at 39 facilities involving 75 wells have been reported. Administrative violations accounted for 50% of these incidents and 50% (42 incidents) were related to construction, design or operational problems. Out of the 42 nonadministrative violations, legal action was required in 10 cases, while the rest were corrected through voluntary compliance.[1]

Of all of the violations, in only nine cases were there significant problems which could have resulted in contamination of USDWs. In five cases, we have evidence that the release did not affect USDWs or if it did, it was not caused by the well:

---

[1] It was not clear in the State record whether legal action was taken in response to major violations. In some cases major violations were corrected through administrative or informal procedures.

- Chemical Waste Management, an off-site facility in Ohio, did not discover leaks in the bottom part of the longstring casing of their wells until large amounts of waste were injected into a shallower formation, which was separated from the bottom of the lowermost USDW by more than 1,500 feet, 1,000 feet of which is confining strata. This operational problem was detected during mechanical integrity tests conducted to obtain information for a UIC permit. The company was fined $12.5 million for these and other violations at the site. Five of the six wells at the site have been repaired and the other may be abandoned.

- Leaks in the wells of the Chemical Resources, Inc., facility (off-site) in Oklahoma were discovered as a result of mechanical integrity tests performed as part of the implementation of the UIC program. The operator is now under State orders to repair the wells and is subject to on-going enforcement action.

- Rollins Environmental Service (formerly CLAW) in Louisiana discovered leaks in a well allegedly resulting from the former owner's (CLAW) disregard for compatibility problems between the wastes, tubing, packer, and casing. Rollins has repaired the leaks and is pursuing legal action against CLAW.

- Sonics International operated a commercial (off-site) facility at Ranger, Texas. Due to shortcomings in the operation there was a well blow-out. There was no ground-water contamination, and the site was cleaned up, and the wells were plugged and abandoned.

- Browning Ferris in Lake Charles, Louisiana contaminated a surficial aquifer at the site. The State does not believe the contamination resulted from injection but rather from surface impoundments. The State is investigating the cause.

In one case, a final determination has not been made:

- At the Hercofina facility in North Carolina, injected wastes leaked from the injection zone through the borehole into the Black Creek Formation which contains water with TDS ranging from <150 - >10,000 mg/l. Two injection wells have been plugged and abandoned and two have stopped operating and are presently being used for monitoring. The State is conducting an investigation.

Finally, in three cases, contamination of a USDW has been documented:

- At the Hammermill facility in Erie, Pennsylvania, apparently because of excessive injection pressures, some of the injected waste migrated through the injection zone and reached an improperly abandoned well. The site, which was closed in 1975, is now on the "Superfund" list for remedial action.

- Shortly after Louisiana received primacy, a well at the Tenneco site in Chalmatte, Louisiana was found to be leaking into one of the lower USDWs (not considered potable). The contaminants consisted of "sour water" refinery waste which had corroded through both tubing and casing. The well was plugged and abandoned. Tenneco is cleaning up the contamination by the use of recovery wells and reinjection into the permitted zone through several new injection wells.

- The Velsicol Chemical Corporation in Beaumont, Texas violated its permit by injecting fluids with a lower pH than authorized. As a result, injected fluids did enter an unauthorized injection zone which contained formation water with a TDS content of 4,000 mg/l TDS. Even though this formation is not considered a potential source of drinking water, Velsicol is using the injection well to clean up the contamination. In addition, wells were drilled and approximately 1.5 million gallons of water were pumped out.

Of special note are the number of violations at off-site (commercial) facilities. Of the total 25 off-site wells, fourteen (56%) have been in violation compared to sixty (24%) of the total 227 on-site wells. Additionally, all three of the abandoned off-site wells had had a major violation. The high percentage of non-compliance by off-site facilities could be due to compatibility problems inherent in injecting many types of waste in the same wells. It was also found that several of the facilities were in violation because of the lack of adequate training of the operator in regard to well operation.

FINDINGS

The inventory has shown that hazardous waste injection is not a widespread practice, as only 15 States have active wells that inject hazardous wastes. Another four States have wells that are no longer injecting hazardous waste.

Hazardous waste wells are concentrated in the industrial areas around the Great Lakes and the Gulf Coast. The geology of these States lends itself to deep injection due to the existence of deep, permeable, stable formations with thick and extensive confining zones. Because oil and gas production also occurs in these areas, the States have acquired considerable information on the regional geology and drilling practices. This information, in turn, can be applied to properly evaluate injection facilities.

Based on the lithologies and separation, most USDWs appear to be adequately separated from injection zones. However, this study did identify a few individual cases where the separations appear inadequate and where repermitting decisions will lead to case-by-case reconsiderations and appropriate actions.

Most HW injection wells (81%) are located in primacy States. The majority (129) of the active wells are in Texas and Louisiana. At this time, Texas has a fully implemented UIC program. The rest of the States are beginning implementation. However, repermitting of Class I HW wells has been made a priority in all States.

In addition, the implementation of the UIC program has produced data which further increases a State's ability to evaluate hazardous waste injection. Repermitting of hazardous waste wells and the associated mechanical integrity tests have identified shortcomings. As a result, these shortcomings have been corrected and USDWs protected. This experience has increased the State's and EPA's knowledge of underground injection and ability to properly implement the UIC program.

Some of the facilities visited have gone beyond the current requirements in order to insure safe injection:

> Most facilities pretreat the waste to avoid down-hole problems such as plugging of the injection formation or interaction of incompatible waste streams.
>
> Some facilities have installed automatic shut-off systems which stop injection when certain monitored parameters reach specific levels.
>
> Certain facilities which inject acids into limestones have developed special operating techniques to prevent well blow-outs or other problems associated with this type of injection.

LOOKING AHEAD

The Hazardous and Solid Waste Amendments of 1984 have mandated the ban of land disposal of hazardous waste unless the Administrator can make a finding that the practice is protective of human health and the environment. Injection of hazardous waste is one of the practices affected by this ban.

In order to provide the technical information necessary for the Administrator to make the required findings, the Agency has started an extensive review of the practice. This review will try to establish the adequacy of the regulations and may lead to regulatory changes should the practice be allowed to continue.

The Agency will also review whether the adequacy of confining zones to prevent the movement of injection fluids outside the injection zone can be clearly established. It is the ability of confining zones to properly isolate wastes which determines the suitability of the site for injection. Once information on the injection and confining zones is obtained, it can be analyzed and models representative of the geology can be employed. These models can provide a better evaluation of the site with more assurances that vertical confinement exists.

We will also evaluate the extent of horizontal movement in the injection zone away from the well. Even though fluids injected into deep formations move slowly (on the scale of inches per year), EPA needs to know the extent of this movement to further evaluate the safety of the practice. Little empirical data exist on the long-term movement of fluids in deep formations; however, experience with secondary recovery of oil and gas shows that this movement is not significant once the driving force (pumping) is stopped. More studies will be needed to confirm this.

Another important consideration that needs to be fully studied is the chemical fate and transport of the waste in the injection formation. Factors such as interactions of the waste with the injection formation and chemical and physical gradients need to be evaluated.

Finally, we have not discussed Class IV wells as part of this report. As the study evolved, only thirty-four such wells were identified of which six are active (two are CERCLA clean-up sites), seventeen are permanently plugged and abandoned, and eleven are abandoned but not yet plugged. Moreover, the UIC program banned such wells effective December 1984 for most States, and in June 1985 for the remaining States. The HSWA of 1984 also banned these facilities, effective May 1985. The practice is, therefore, limited and soon to be terminated. Most States already ban the practice, and when Class IV wells are identified in those States they are shut down. Accordingly, very little data is available in State files.

Chapter I

Background-History

1.1 Introduction

This report was prepared to meet the requirement of section 701 of "The Hazardous and Solid Waste Amendments of 1984". This section requires EPA to prepare a report on the characteristics of wells which inject Hazardous Waste (HW) in The United States. This chapter provides a brief description of the relevant portions of the Underground Injection Control (UIC) program and the background and methodology used to obtain information for the report.

1.2 The Underground Injection Control (UIC) Program

The Underground Injection Control (UIC) Program was mandated by Congress in Part C of the Safe Drinking Water Act (SDWA) of 1974 as amended. The Environmental Protection Agency (EPA) published final technical UIC regulations on June 24, 1980. These regulations set minimum technical standards which the States and EPA must follow in implementing the UIC program. The UIC technical regulations can be found under 40 CFR Part 146. The technical regulations were amended in 1982 to incorporate changes resulting from litigation settlements.

The basic concept of the EPA UIC program is to prevent the contamination of underground sources of drinking water (USDW)* by keeping injected fluids within the well and in the intended injection zone. Two categories of wells are identified by the UIC regulations for injection of hazardous waste, i.e., Class I and Class IV. Class I wells inject hazardous waste below the lowermost USDW and Class IV wells inject into or above a USDW. Stringent requirements in the regulations pertain to Class I wells. Class IV wells have been banned and are required to be plugged and abandoned six months after the UIC program becomes effective in a State. Furthermore, the Hazardous and Solid Waste Amendments of 1984 have reinforced the ban by requiring all Class IV wells to be plugged and abandoned by May 8, 1985 (RCRA, Section 7010). Therefore, this study includes a detailed inventory of Class I wells, since 701(a) of the HSWA requires the Agency to inventory only those wells... which inject hazardous waste (emphasis added); the ban on Class IV wells means no such well may "inject" hazardous waste after May 8, 1985. Nevertheless, for informational purposes, EPA has appended the raw data on Class IV wells available to the Agency on the 34 active and closed Class IV wells which have injected HW, that have been identified during the preparation of this report. The Agency has placed a high priority upon ensuring that all Class IV wells are closed and plugged as required by the HSWA and EPA regulations.

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* As defined in 40 CFR §144.3

There are five major ways in which injection practices can cause fluids to migrate into USDWs. The technical requirements in the UIC regulations are therefore, designed to deal with the five pathways of fluid migration as described below:

(1) Faulty Well Construction

Leaks in the well casing or the movement of fluid forced back up between the well's outer casing and the well bore can cause contamination of USDWs. The regulations require adequate casing and cementing to protect USDWs and to isolate the injection zone. The absence of significant leaks and fluid movement in the space between the casing and the well bore must be demonstrated upon well completion and at least every five years thereafter by a "mechanical integrity test", as defined in 40 CFR §146.08.

(2) Improperly Plugged or Completed Wells in the Zone of Endangering Influence:

Fluids from the pressurized area in the injection zone may be forced upward through improperly plugged or completed wells that penetrate the injection interval in the zone of endangering influence. These fluids may migrate into USDWs. The UIC regulations require that all wells penetrating the injection zone in the zone of endangering influence be reviewed to assure that they are properly completed or plugged. Corrective action must be taken if they are not completed or plugged to prevent fluids migration. Newly abandoned wells must be plugged to conform with EPA and State UIC procedures.

(3) Faulty or Fractured Confining Strata:

Fluid may be forced upward out of the injection zone through faults or fractures in the confining formations, as the result of injection. The UIC regulations require that wells be sited so that they inject below an adequate confining formation. Injection pressure must be controlled so that fractures are not propagated in the injection zone or initiated in the confining formation that could cause the movement of injection or formation fluids into an underground source of drinking water (USDW).

(4) Lateral Displacement:

Fluid may be displaced from the injection zone into hydraulically connected USDWs as a result of the injection pressure. The regulations require careful planning to select the injection site to prevent such situations. Information on the continuity of the injection and confining zones must be considered when evaluating the site, as well as the proximity of injection wells to USDWs. Also faults and the distance from recharge areas must be taken into account. Well operators must control injection pressure and conduct other monitoring activities to prevent the lateral migration of fluids.

(5) Direct Injection:

Some injection wells inject into or above USDWs. EPA has banned all injection of hazardous waste into or above underground sources of drinking water except for wells associated with Federal activities designed to clean up an aquifer.

As of March 18, 1985, 32 States* had applied for and received enforcement authority of the UIC program for Class I HW wells. The Agency has promulgated 25 programs in States that chose not to or did not obtain delegation of the UIC program for Class I HW wells.

1.3 Hazardous Waste Well Assessment and Inventory

1.3.1 Need for the Assessment and Inventory

In 1981, the Office of Solid Waste of EPA conducted a survey of hazardous wastes management practices by sending questionnaires to owners and operators of facilities who had

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*"States" are defined in the Safe Drinking Water Act as the 50 States, Puerto Rico, the Virgin Islands, the District of Columbia, Samoa, Guam, the Trust Territories and the Northern Marianas (a total of 57).

notified the Agency that they handled hazardous wastes, pursuant to notification requirements under the Resource Conservation and Recovery Act (RCRA). The results of this survey were published in "National Survey of Hazardous Waste Generators and Treatment, Storage and Disposal Facilities Regulated Under RCRA in 1981" (EPA 530/SW-84-005, April 1984).

The RCRA survey identified 87 hazardous waste injection facilities used to dispose of an estimated 8.7 billion gallons per year. As a result of the magnitude of volume of the waste injected, the Agency started a limited effort to investigate the characteristics of hazardous waste injection.

Almost concurrently, several bills were introduced in Congress (S-757, HR 5959 and HR 2867) each of which required EPA to prepare a report on hazardous waste injection practices. On October 5, 1984, Congress passed the reauthorization of the Resource Conservation and Recovery Act (RCRA). The amendments in the reauthorization took the short title of "The Hazardous and Solid Waste Amendments of 1984" and became effective November 8, 1984. Included is the prohibition of injection of certain hazardous wastes within 45 months of enactment, unless the EPA Administrator makes a finding that such injection is not damaging to human health and the environment. Another requirement is that EPA prepare a report to Congress on hazardous waste injection (section 701). Section 701 of the "Hazardous and Solid Waste Amendment of 1984" reads (verbatim):

"Report to Congress on Injection of Hazardous Waste.

(a) The Administrator, in cooperation with the States, shall compile and, not later than 6 months after the date of enactment of the Hazardous and Solid Waste Amendments of 1984, submit to the Committee on Environment and Public Works of the United States Senate and the Committee on Energy and Commerce of the United States House of Representatives, an inventory of all wells in the United States which inject hazardous wastes. The inventory shall include the following information:

" (1) the location and depth of each well;

(2) engineering and construction details of each including the thickness and composition of its casing, the width and content of the annulus, and pump pressure and capacity;

(3) the hydrogeological characteristics of the overlying and underlying strata, as well as that into which the waste is injected;

(4) the location and size of all drinking water aquifers penetrated by the well, or within a one-mile radius of the well or within two hundred feet below the well injection point;

(5) the location, capacity, and population served by each well providing drinking or irrigation water which is within a five-mile radius of the injection well;

(6) the nature and volume of the waste injected during the one-year period immediately preceding the date of the report;

(7) the dates and nature of the inspections of the injection wells conducted by independent third parties or agents of State, Federal or local government;

(8) the name and address of all overseers and operators of the well and any disposal facility associated with it;

(9) the identification of all wells at which enforcement actions have been initiated under this Act (by reasons of well failure, operator error, groundwater contamination or for other reasons) and an identification of the wastes involved in such enforcement actions; and

(10) such other information as the Administrator may, in his discretion, deem necessary to define the scope and nature of hazardous waste disposal in the United States through underground injection."

(b) In fulfilling the requirements of paragraphs (3) through (5) of subsection (a), the Administrator need only submit such information as can be obtained from currently existing State records and from site visits to at least 20 facilities containing wells which inject hazardous waste.

(c) The states shall make available to the Administrator such information as he deems necessary to accomplish the objectives of this section."

1.3.2 Methodology

In preparation for the report required in the several bills

27<

introduced, which culminated with the promulgation of section 701, of the "Hazardous and Solid Waste Amendments of 1984", EPA started gathering information in late 1983. In order to conduct an in-depth assessment of hazardous waste injection wells, EPA selected 20 facilities representing a cross section of geographic areas, on-and off-site waste generation and mixed delegation situations. These 20 facilities operate a total of 59 injection wells with waste streams that cover a broad spectrum. The focal points of this assessment study were facility design, siting, construction, operation and maintenance of both above ground facilities regulated under RCRA and below ground facilities regulated under UIC. The existing Federal and State oversight and enforcement programs were also assessed. These programs were examined to determine if there were significant regulatory gaps. Three (3) of the twenty facilities were subsequently found not to meet the Class I hazardous waste definition and are not included in this report.

EPA selected the 20 facilities based on a 1981 hazardous waste injection well inventory compiled by the Office of Solid Waste (OSW) as a result of the notification process under the authority of the Resource Conservation and Recovery Act (RCRA). (The 1981 inventory identified 87 hazardous waste injection facilities nationwide with a total estimated injection volume of 8.7 billion gallons in 1981.) In order to investigate the extent and impact of this practice, a coordinated effort between the Office of Drinking Water, the Office of Solid Waste, EPA Regions and States, was launched. Table I-1 lists the 20 facilities selected for the detailed assessment. The current operating performance of the injection wells was not used as a criterion for the selection of these wells. Figure I-1 shows the location of these facilities on the national map.

The facilities selected represent a sample size of over 20% of the total known hazardous waste injection wells in the United States. Table I-2 portrays the various criteria that the selected sites represent.

Additional analysis on the facilities based on their age, waste distribution, industrial category and depth of injection zone/USDW separation was conducted in order to establish a firm relationship with the data base of all hazardous waste injection wells. The results of the assessment of the 20 facilities and data obtained on the other HW facilities are used to portray the national picture of all the Class I HW injection wells.

Following the selection of the facilities, a field assessment was conducted. EPA organized a technical task force which was led by the Office of Drinking Water (ODW) in cooperation with the Office of Solid Waste (OSW). The technical task force included individuals in several disciplines such as geology, environmental

28<

Table I-1

LIST OF CLASS I HAZARDOUS WASTE INJECTION FACILITIES VISITED

Region	State	Facility Name and Location	# Wells at Facility
III	WV	E.I.Dupont De Nemours* Belle, West Virginia	1
IV	AL	Stauffer Chemical Bucks, Alabama	3
	FL	Kaiser Aluminum & Chemical Mulberry, Florida	1
	KY	E.I.Dupont De Nemours Louisville, Kentucky	2
	MS	Filtrol Corporation Jackson, Mississippi	1
	TN	Stauffer Chemical** Mt. Pleasant, Tennessee	4
V	IL	Allied Chemical Corporation Danville, Illinois	1
		Cabot Corporation Tuscola, Illinois	2
	IN	Inland Steel Gary, Indiana	1
	MI	BASF Wyandotte Corporation Holland, Michigan	3
	OH	SOHIO Chemical Corporation Lima, Ohio	3
		Chemical Waste Management Incorporated Vickery, Ohio	6
VI	LA	Rollins Environmental Services Plaquemine, Louisiana	1

* State of West Virginia and Region III subsequently determined that the waste injected by this facility does not meet the RCRA definition for classification as a hazardous waste management facility.

** State of Tennessee later determined that this facility does not inject "hazardous waste". TN has been granted authorization under RCRA to make this determination.

LIST OF CLASS I HAZARDOUS WASTE INJECTION FACILITIES VISITED (cont'd.)

Region	State	Facility Name and Location	# Wells at Facility
VI	LA	Shell Oil Company Norco, Louisiana	12
	OK	Chemical Resources Tulsa, Oklahoma	1
	TX	E.I.Dupont Victoria, Texas	10
		Empak, Incorporated Deerpark, Texas	1
		Gibraltar Wastewaters Winona, Texas	1
		Monsanto Company Alvin, Texas	4
IX	CA	Rio Bravo Refining Kern County, California	1
Total	14	20	59

30<

FIGURE I-1

LOCATION OF CLASS I HAZARDOUS WASTE INJECTION FACILITIES

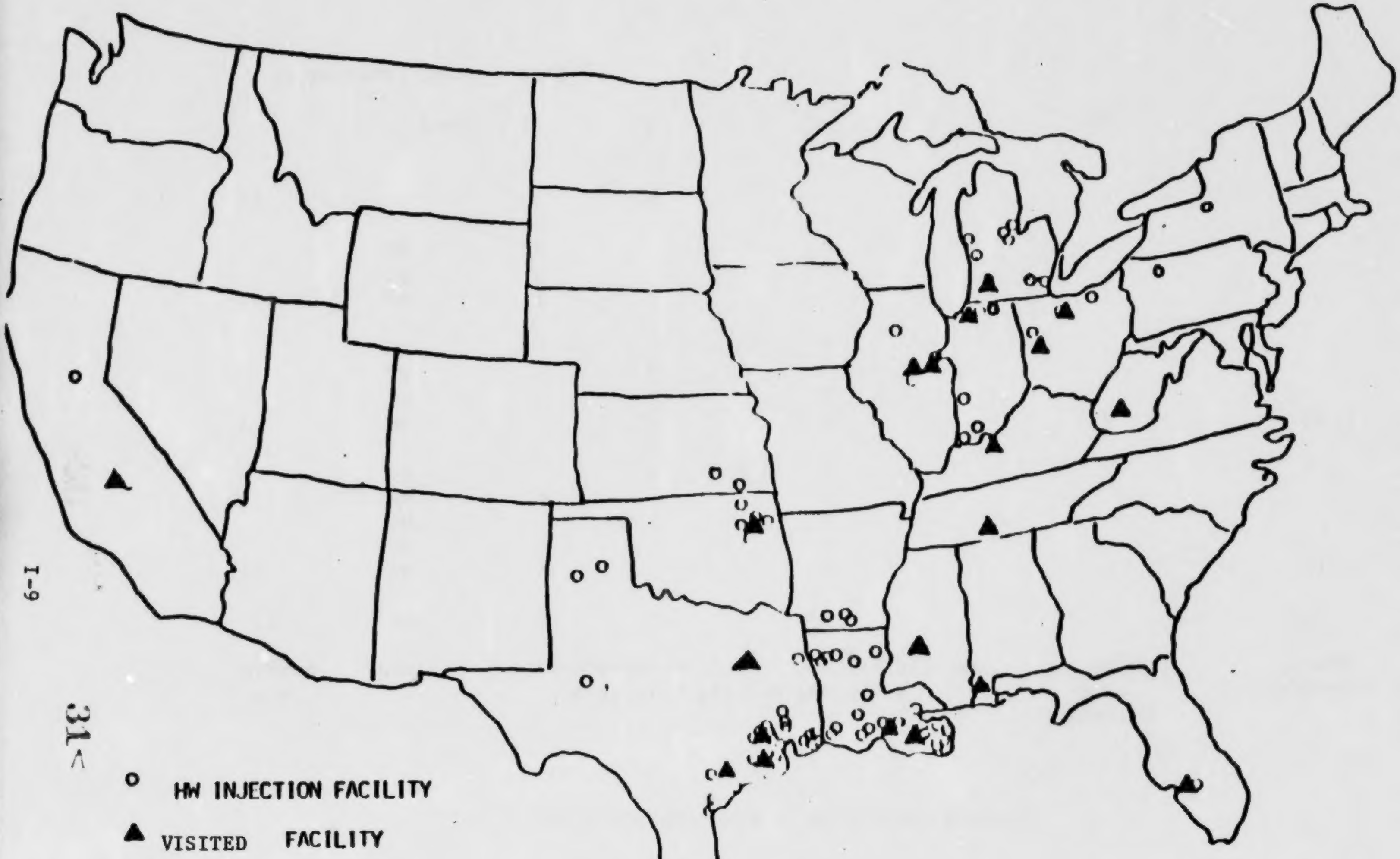
○ HW INJECTION FACILITY
▲ VISITED FACILITY

TABLE I-2

REPRESENTATIVENESS OF FACILITIES VISITED

EPA Region	State	Facilities Visited Per State				# Visited For Region	% of Regional Total
		Primacy	Nonprimacy	On-Site	Off-Site		
III	WV*	1		1		1	100
IV	FL	1		1		5	71
	AL	1		1			
	TN*		1	1			
	MS	1		1			
	KY		1	1			
V	MI		1	1		6	23
	OH		2	1	1		
	IN		1	1			
	IL	2		2			
VI	OK	1			1	7	9
	TX	4		2	2		
	LA	2		1	1		
IX	CA		1		1	1	25
	Total	13	7	14	6	20	
% of National Total		17.8					

* These two facilities were subsequently found to inject non-hazardous waste

and chemical engineering, geochemistry and hydrology. The assessment task force was augmented by scientific and technical support from the EPA Regional Offices and States responsible for the selected facilities.

Visits to all the selected facilities took place during the month of September 1983. Regional personnel participated in all the visits and Headquarters ODW personnel accompanied them on 17 out of the 20 visits. An OSW representative also participated in two of the visits. These site visits served to corroborate data from State and EPA files and to make members from the task force familiar with each site.

After the site visits, the Regional participants prepared a facility report in the format in Table I-3 as recommended by the task force. A compilation of the field reports from the twenty facilities actually visited by EPA personnel is available from the Office of Drinking Water or the appropriate Regional Office.

Information on the hazardous waste facilities not visited was obtained from EPA and State files and other miscellaneous sources.

Upon review of the information obtained, it was compiled in an electronic file for easy retrieval. Both the paper and computer files were reviewed for missing information. Missing data were identified and an effort was made to obtain them. These efforts included direct contact with 94 hazardous waste injection facilities to verify data obtained mainly from State files. There was approximately 70% response to this verification effort. Table I-4 gives a description of the quality of the data obtained in the overall information gathering effort.

In order to answer questions posed in Section 701 of "The Hazardous and Solid Waste Amendments of 1984", the information obtained in the inventory and assessment was summarized under: general findings; hydrogeologic environment; engineering characteristics; waste characteristics; and regulatory controls. In addition, the data obtained in the inventory and assessment have been included in the appendices of this report. These appendices have been organized in accordance with the specific information obtained to answer the questions in Section 701 of the RCRA amendments.

TABLE I-3

OUTLINE OF CLASS I HAZARDOUS WASTE INJECTION FACILITY REPORT
(ONE REPORT FOR EACH FACILITY)

Facility Identification

Summary

Introduction

Geologic and Hydrologic Environment

Well Design and Evaluation

Regulatory Controls (UIC, RCRA, NPDES)

Conclusions

Recommendations

References

Appendices (as needed)

34<

TABLE I - 4

HAZARDOUS WASTE INJECTION WELLS -- QUALITY OF DATA COLLECTED

	Information Collected	Completeness	Accuracy	Comments
1.	General Well Identification	very good	very good	
2.	General Well Data	good	good	Original permitting information not always available.
3.	Geological Data	good	good	Not always site specific.
	Geohydrology	fair	fair	Not well documented in files.
	USDWs	fair	fair	Not well documented in files.
4.	Well Design	good	good	
	Construction	very good	very good	Cementing data not always accurate
	Plugged Wells in AOR	very poor	very poor	Not always accurate.
5.	Injection Data			
	Waste Characteristics	fair	fair	From RCRA forms, and verification effort.
	Waste Concentration	fair	fair	RCRA codes not always available for injection.
	Waste Volume	good	good	
6.	Well Testing	poor	good	Partially documented in General Correspondence.
7.	Monitoring Requirements			
	Injection Fluid	good	good	From State officials,
	Monitoring Wells	good	good	Not for injection wells.
8.	Inspection and Surveillance	good	good	From State officials, not well documented.
9.	Noncompliance	poor	poor	Not well documented.
10.	Remedial Action	poor	poor	Not well documented.
11.	Permit Limitations	fair	fair	
12.	Miscellaneous	fair	good	
	Water Supply Wells	poor	poor	Not available in State file.

As is to be expected in a limited information gathering effort like this one, the data presented do not represent a complete picture. As an example, table III-2, in page III-10 indicates that there is a wide variation in the thickness of confining zones; however, there is not enough available information on whether the thicker confining zones are more impermeable than the thin ones. A site specific effort would be necessary to ascertain this fact.

Chapter II

General Findings

2.1 Introduction

This chapter describes the general characteristics of hazardous waste wells nationwide. Parameters considered are:

- ° Well Operating Status;
- ° Volumes Injected;
- ° Well Classes;
- ° Type of Operation (on-site, off-site);
- ° Geographical distribution;
- ° Age of the Wells;
- ° Users; and
- ° Surface Facilities.

Additionally, the appendices contain tables showing the status; the name and address (active); the type and the RCRA ID numbers for the wells.

2.2 Well Operating Status

In the context of this report, the term "active well" is used to describe a hazardous waste (HW) well which is operated either continuously on a regular schedule, or on an occasional or intermittent basis and for which there are no extensive shut-ins or workovers.* This category includes all intermittent, back-up and standby HW wells, provided that they are in operational condition. "Abandoned well" is a HW well whose use has been temporarily or permanently discontinued, including any well that has ceased HW injection or is plugged and abandoned. "Other" refers to any HW well which has been permitted but not yet drilled, a well under construction, a completed well not yet injecting, or a well with a permit pending. "Shut in" refers to a well that is indefinitely shut in for repair or for other reasons.

Nationwide, there are 112 facilities, identified by this inventory, that have a total of 252 wells that fall into one of the categories mentioned above. Ninety of these facilities injected hazardous waste into 195 wells during 1984, with 152 operating continuously and 43 operating intermittently. The balance of the 252 wells (57 wells)are inactive, either abandoned (41); shut in or in the process of changing type of operation (3); or with a permit pending or under construction (13).

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* "Active" and "Active I" respectively in the appendices

The States with the largest number of active HW wells are: Texas with 69; Louisiana with 60; Ohio with 14; and Michigan with 11. Figure II-1 gives the percentages of wells in each operational category. Table II-1 gives the total number of wells and facilities in each of the operational categories for each State.

2.3 Volumes Injected

A total of 144 wells reported actual injection volumes in 1983. The volume injected in the 144 wells in 1983 was 8.309 billion gallons. An additional 37 wells were active in 1983, but they did not report volumes injected. The volume injected for these additional 37 wells was calculated from the reported injection rate. This calculated volume was then corrected by multiplying by 0.73 which was the ratio of the reported volume vs. the volumes calculated from the injection rate for 114 wells. (These 114 wells reported both injection volumes and injection rates in 1983.)

To summarize:

° Volume reported for 144 HW wells	8.309 billion gal.
° Volume computed for 37 wells	[4.425 billion gal.]
° Corrected by multiplying by 0.73	+3.230 billion gal.
° Total reported and computed for 181* wells	11.539 billion gal.

A comparison of design vs. reported volume in 93 out of the 195 active wells indicate that only 29% of their capacity is being used This would indicate that the total capacity of all HW injection wells is approximately 40 billion gallons per year.

2.4 Well Classes

As explained in Chapter I, Class I by definition includes HW wells that inject into deep formations which are below USDWs; Class IV refers to those HW wells that inject into or above USDWs. The UIC Regulations apply very stringent standards to assure that Class I HW wells do not contaminate USDWs and ban Class IV HW wells.

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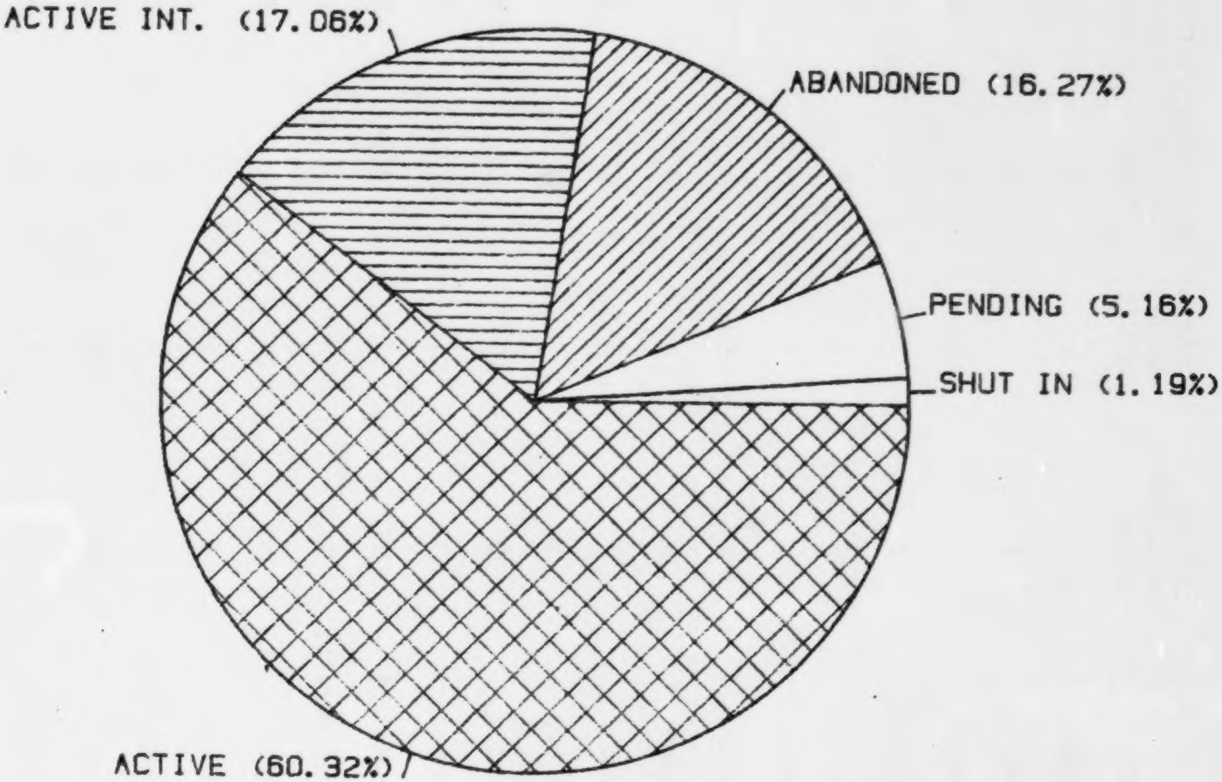
* Only 181 wells were active in 1983. An additional 12 wells resumed or started injection in 1984.

FIGURE II-1

OPERATIONAL STATUS OF HW WELLS*
252 WELLS IN 112 FACILITIES



*As of March 1985

TABLE II-1

OPERATING STATUS OF CLASS I HAZARDOUS WASTE WELLS AT FACILITIES IN THE UNITED STATES (AUGUST 1984)

STATE	ACTIVE FACILITIES TOTAL	ACTIVE WELLS TOTAL	ABANDONED WELLS TOTAL	OTHER WELLS TOTAL	WELLS/ FACILITY TOTAL*-**
Alabama	1	2	1	0	3/1
Alaska	1	1	0	1	2/1
Arkansas	3	4	1	0	5/3
California	2	2	0	0	4/3
Colorado	0	0	0	2	1/1
Florida	2	4	0	0	4/2
Illinois	4	6	0	0	6/4
Indiana	6	8	5	0	13/10
Kansas	1	5	2	0	7/2
Kentucky	1	2	0	0	2/1
Louisiana	22	60	5	6	71/28
Michigan	7	11	11	0	22/10
Mississippi	1	1	0	0	1/1
North Carolina	0	0	4	0	4/1
Ohio	5	14	1	0	15/5
Oklahoma	5	6	1	1	8/6
Pennsylvania	0	0	3	0	3/1
Texas	29	69	7	5	79/31
Wyoming	0	0	0	1	1/1
TOTALS	90	195	41	16	252/112

* Total includes inactive and active facilities

** Since there are some "inactive" wells in "active" facilities, for the sake of clarity a separate column for facilities where there are inactive (abandoned, others) wells has not been included.

40<

TABLE II-2

ESTIMATED VOLUME OF HAZARDOUS WASTE INJECTION IN THE UNITED STATES IN 1983

STATE	REPORTED INJECTED VOLUME	REPORTED NUMBER OF WELLS	COMPUTED* INJECTED VOLUME	COMPUTED* NUMBER OF WELLS	TOTAL INJECTED VOLUME	TOTAL NUMBER OF WELLS
Alabama	51,473,408	2	-	-	51,473,408	2
Alaska	8,048,250	1	-	-	8,048,250	1
Arkansas	7,379,436	2	360,826,502	2	368,205,938	4
California	1,330,390	1	-	-	1,330,390	1
Florida	756,200,000	4	-	-	756,200,000	4
Illinois	86,114,740	3	114,791,040	2	200,905,780	5
Indiana	136,192,259	6	50,125,421	1	186,317,680	7
Kansas	497,700,000	5	-	-	497,700,000	5
Kentucky	73,300,000	2	-	-	73,300,000	2
Louisiana	2,766,206,012	47	1,149,822,124	8	3,916,028,136	55
Michigan	153,033,000	6	122,902,940	5	275,935,940	11
Mississippi	130,000,000	1	-	-	130,000,000	1
Ohio	322,789,305	10	70,940,862	4	393,730,167	14
Oklahoma	399,761,720	5	188,697,600	1	588,459,320	6
Texas	2,919,371,045	49	1,171,595,618	14	4,090,966,663	63
TOTAL	8,308,899,565	144	3,229,702,107	37	11,538,601,672	181**

* These volumes have been computed from reported average injection rates and corrected by a factor of 0.73 This factor was determined by comparing actual volumes to volumes computed from reported injection rates for 114 wells

** Fourteen wells that were not "active" in 1983 started or resumed operation in 1984.

Table II-1 gives the location of and operating status of Class I HW wells that have been identified nationwide. There are five wells, three in Pennsylvania and two in California, which are or will be used to restore aquifers under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). These wells are technically Class IV wells but are authorized under a special exemption. They are mentioned here because they will continue to operate legally.

As indicated by Table II-1, 195 active Class I HW wells in 90 facilities* have been identified in 15 States.

2.5 Type of operation

In the course of the HW well assessment and inventory, it was observed that 90.1% of the wells were owned and operated by the waste generators themselves and were located at the site of the generating facility. These wells have been classified as "on-site" wells. Commercial wells operated by persons who collect service fees for the disposal of the waste and which are located at places other than the waste generating facility are classified as "off-site" wells. A total of 25 HW wells in 16 facilities have been identified as off-site; 18 of which are active. The remaining seven were either abandoned or in the process of being built or recompleted. The "off-site" wells have special characteristics which make them more susceptible to problems and they account for an inordinate number of violations. Chapter VI lists the violations and Chapter VII gives some possible reasons for them. Table II-3 and Figure II-2 shows the number of off-site wells and facilities for each State. The total volume injected into these wells is 4.1% of the total estimated volume.

2.6 Geographic Distribution

The great majority of HW injection wells are located in the Gulf Coast and Great Lakes states. Figure II-3 shows the number of active HW wells in each state. The siting of HW wells in a certain region of The United States follows the same historical

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* As of the time of this report decisions are being made as to the classification of a small number of wells. Furthermore, there is the possibility that the well classification of several of the wells listed may change due to the fact that well classification is a derivative function that depends on RCRA regulations and State determinations (where applicable).

Table II-3

OFF-SITE WELLS AND FACILITIES IN EACH STATE

STATE	ACTIVE WELLS	OFF-SITE FACILITIES	INACTIVE WELLS	OFF-SITE FACILITIES	TOTAL WELLS	OFF-SITE FACILITIES
Alaska	1	1	1	1	2	1
California	1	1	0	0	1	1
Louisiana	2	2	0	0	2	2
Ohio	5	1	1	1	6	1
Oklahoma	1	1	0	0	1	1
Texas	8	7	5	4	13	10
	18	13	7	6	25	16*

* There are both active and inactive wells at some off-site facilities

FIGURE II-2

ON-SITE & OFF-SITE ACTIVE WELLS

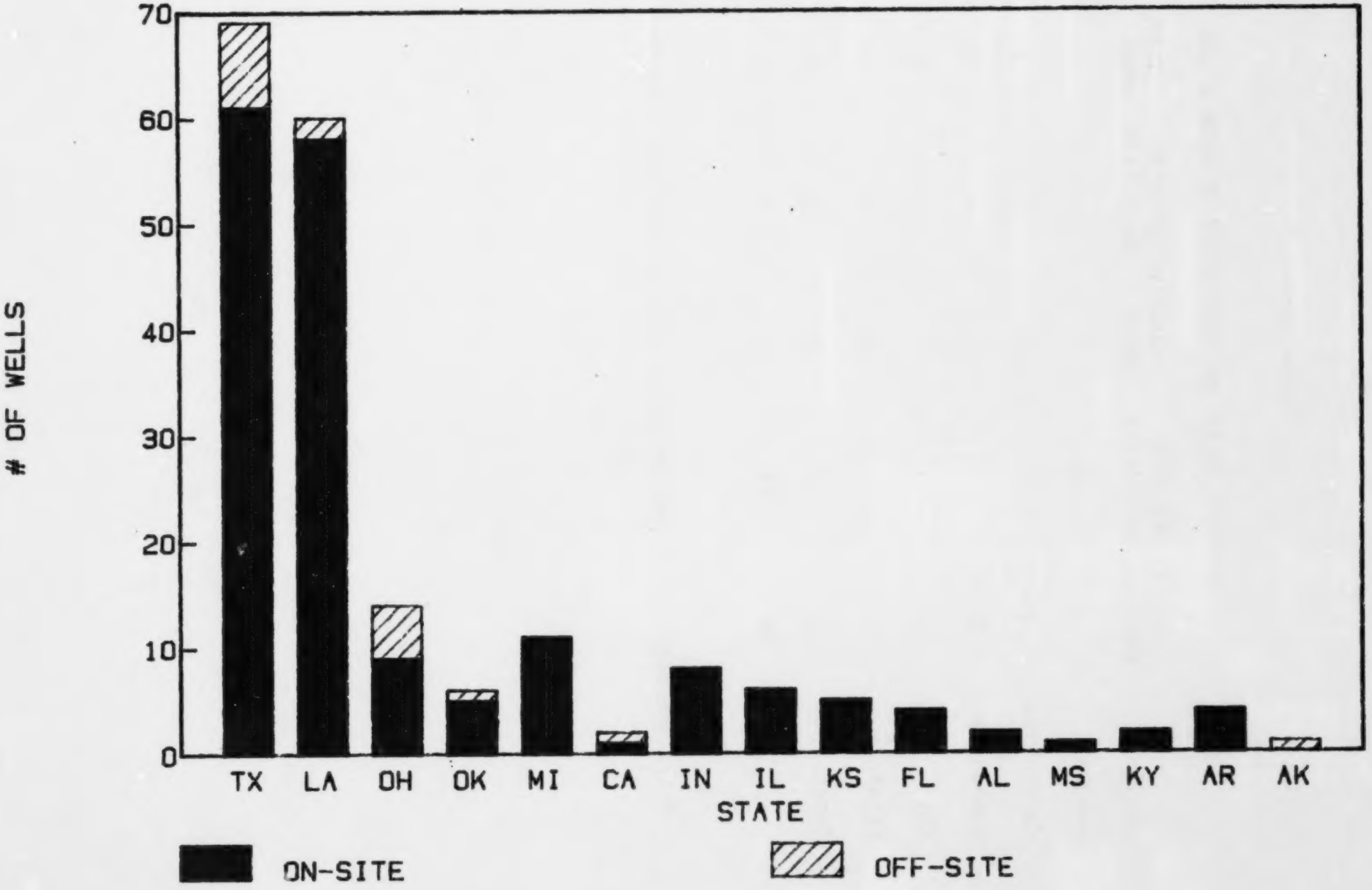
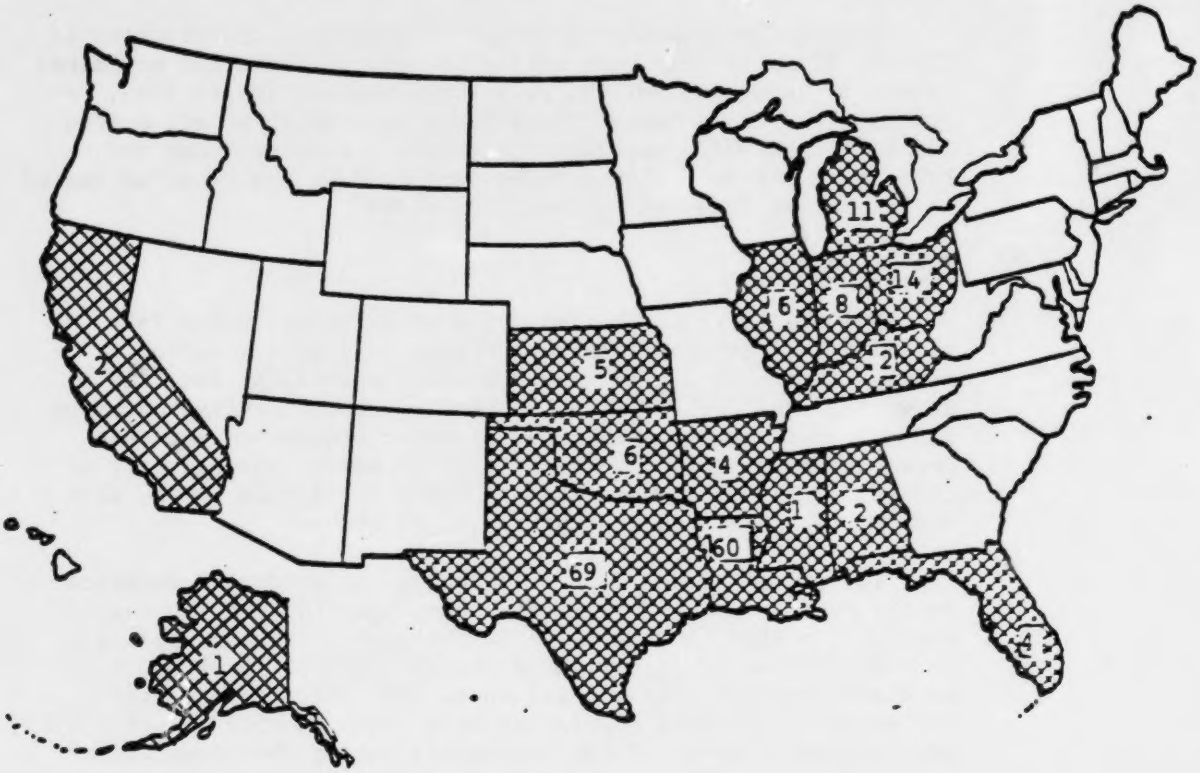


FIGURE II-3

DISTRIBUTION OF ACTIVE CLASS I HAZARDOUS WASTE INJECTION WELLS (1984)


11
14
6
8
2
2
5
6
4
1
2
60
69
4
1

and geological pattern. The States with the great majority of wells Texas, Louisiana, Ohio and Michigan have had similar historical and geological backgrounds. Historically, these States have had experience in underground injection due mainly to oil and gas related activities. Geologically, there are formations in these States which are amenable to efficient injection. Another common characteristic, although not exclusive to just these two regions, is that both are highly industrialized.

Tables II-1 and II-2 give the geographical distribution of the 195 HW wells that were active in 1984 by state and estimated volume of injection for 181 wells that were active in 1983, respectively. These tables demonstrate that 66.0% of all active identified HW wells are located in just 2 States, Texas and Louisiana, and that they account for 69.4% of the total estimated volume of hazardous waste injected in 1983.

2.7 Age of Wells

The use of wells for injection of hazardous waste is a relatively recent development. Figure II-4 is a graphic representation of the distribution of the drilling date for all HW wells. The earlier HW wells were generally drilled to serve other purposes such as oil, gas or water production and were converted to injection wells at a later date. The majority of the wells were drilled in the mid 1960s to the mid 1970s, with most of the injection commencing in the 1970s.

The annual growth rate of HW wells has gradually declined in the past decade. The average annual growth rate for the period from 1972 to 1982 was 6.5% per year. This is equivalent to a projection of 15 new wells for 1984 and 17 for 1985, based on the current HW well population of 248. The biggest yearly increases in the well population were found in 1969 and 1973-1975, possibly as a result of the implementation of the Clean Water Act.

2.8 Users of HW Wells

The type of industries using HW wells are listed in Figure II-5 according to their contribution to the estimated total volume injected. The typical user of wells for injection of hazardous waste is a large industry which produces large volumes of low concentration waste. The original financial investment is very high and requires continuous operation of the well, in most cases, to be economically feasible.

46<

Figure II-4

CLASS I HW WELLS BUILT PER YEAR

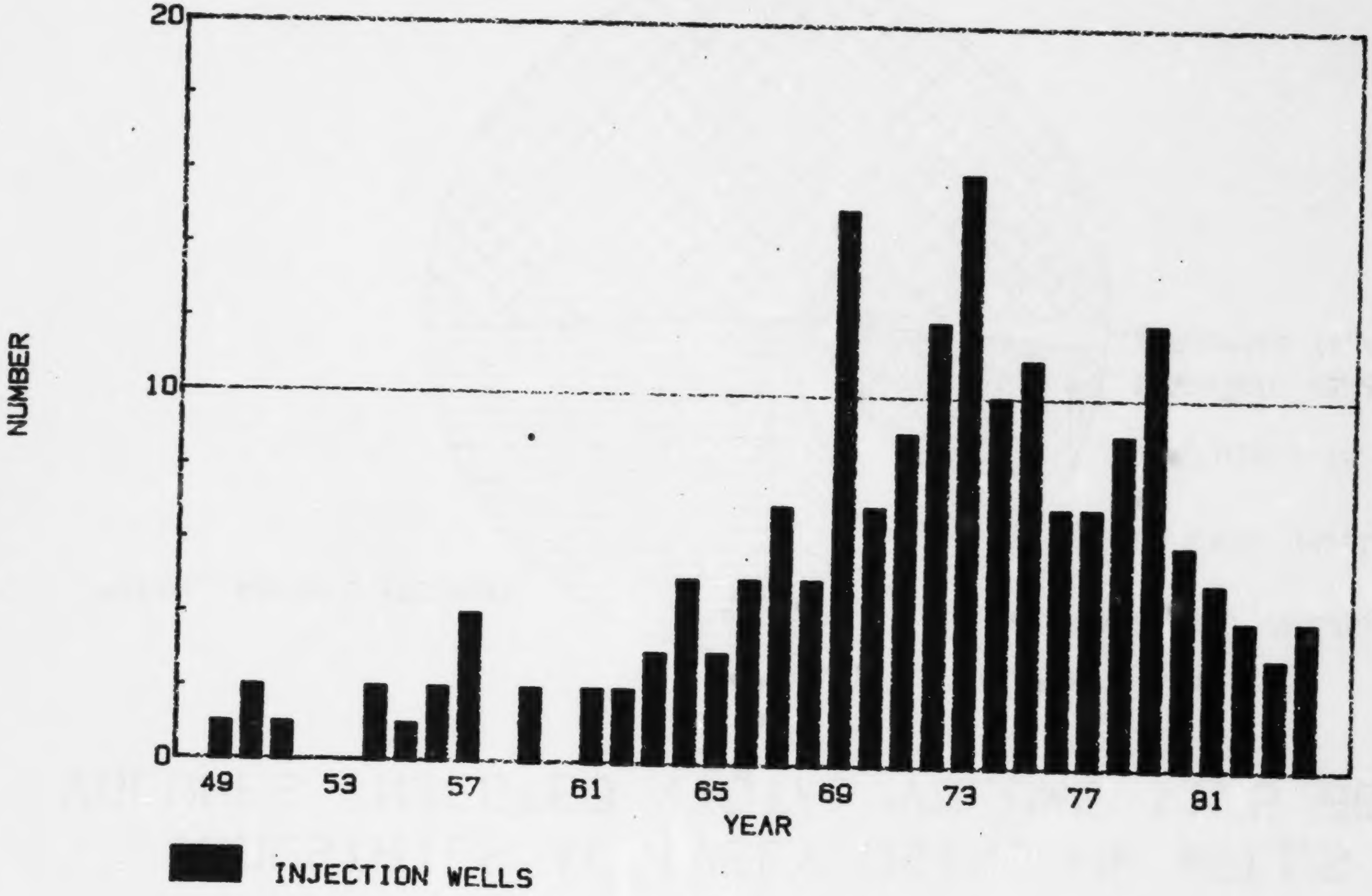


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FIGURE II-5

INDUSTRIES ACTIVELY USING HW WELLS VOLUMES INJECTED (TOTAL VOLUME 11.5 BG)

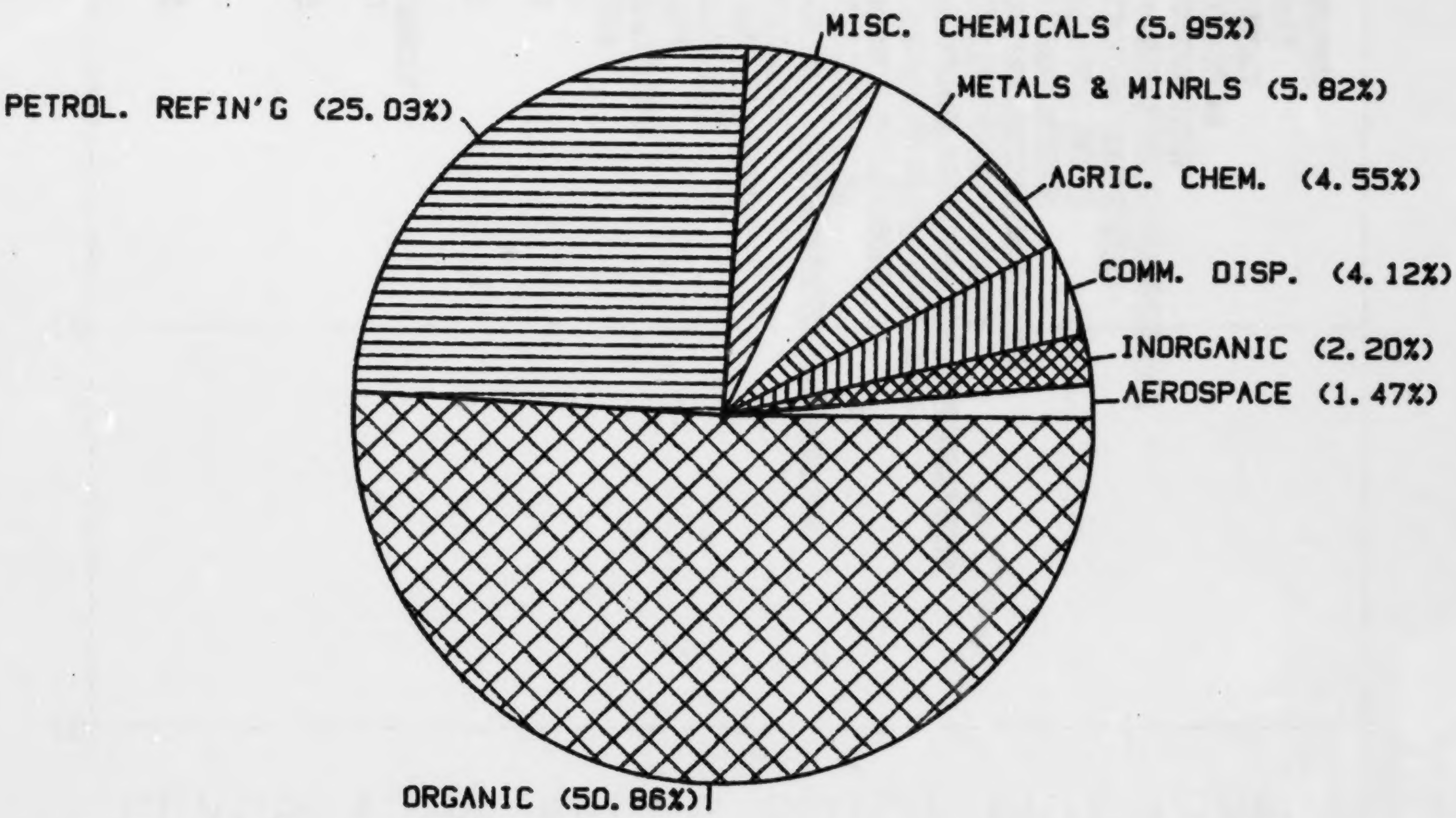


Figure II-6

INDUSTRIES ACTIVELY USING HW WELLS
NUMBER OF WELLS (TOTAL OF 195 WELLS)

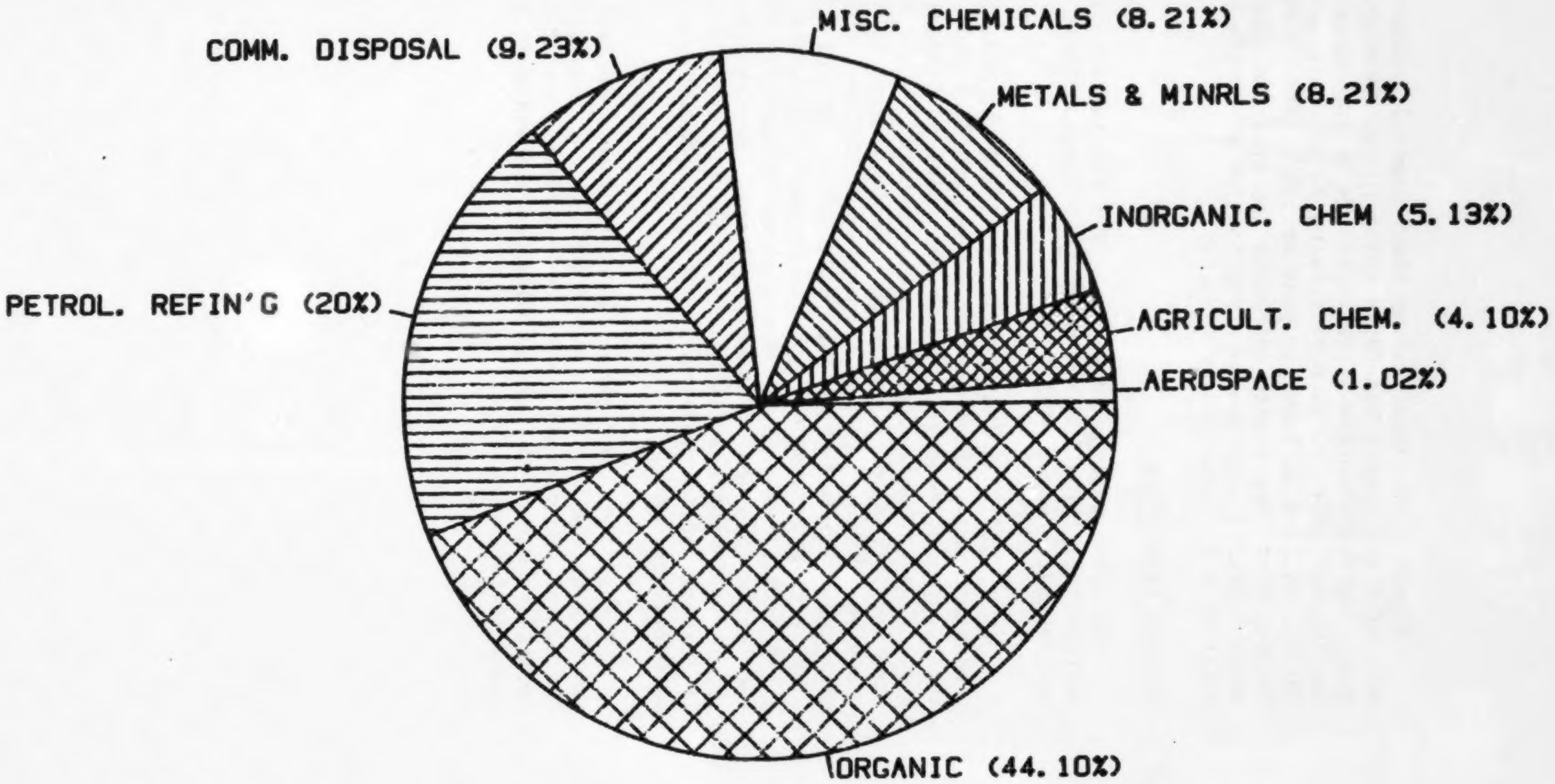


Figure II-5 clearly shows that chemical industries generate most of the injected hazardous waste in the country. Table II-4 gives the distribution of HW injectors by industrial category. The largest user, E. I. DuPont, with 31 HW wells, alone accounts for 1.5 billion gallons per year or 13% of the total volume injected. Chapter V of this report addresses the type and quantity of hazardous waste injected underground. Figure II-6 gives the percentage of wells used by each type of industry.

2.9 Surface Facilities

The Office of Solid Waste in EPA has jurisdiction over all surface facilities located at HW well sites. These facilities are regulated under RCRA.

In April 1984, EPA's Office of Solid Waste released the findings from an extensive survey of hazardous waste generators and treatment, storage and disposal (TSD) facilities regulated under RCRA in 1981. Survey results estimated that 4,818 facilities treated, stored, or disposed of hazardous waste in RCRA regulated processes. Hazardous waste storage was the most prevalent management activity regulated under RCRA. Out of 4,818 facilities, 4,299 were estimated to have stored hazardous waste, an estimated 1,495 facilities treated hazardous waste and only about 430 facilities disposed of hazardous waste. Eventhough underground injection is not a widespread practice (it is only practiced in 15 States), it is the method used to dispose of the largest volume of hazardous waste.

Figure II-7 summarizes the various surface facilities existing at the hazardous waste underground injection sites. The sum of the various processes exceeds the total number of facilities due to the use of multiple processes at some of these facilities.

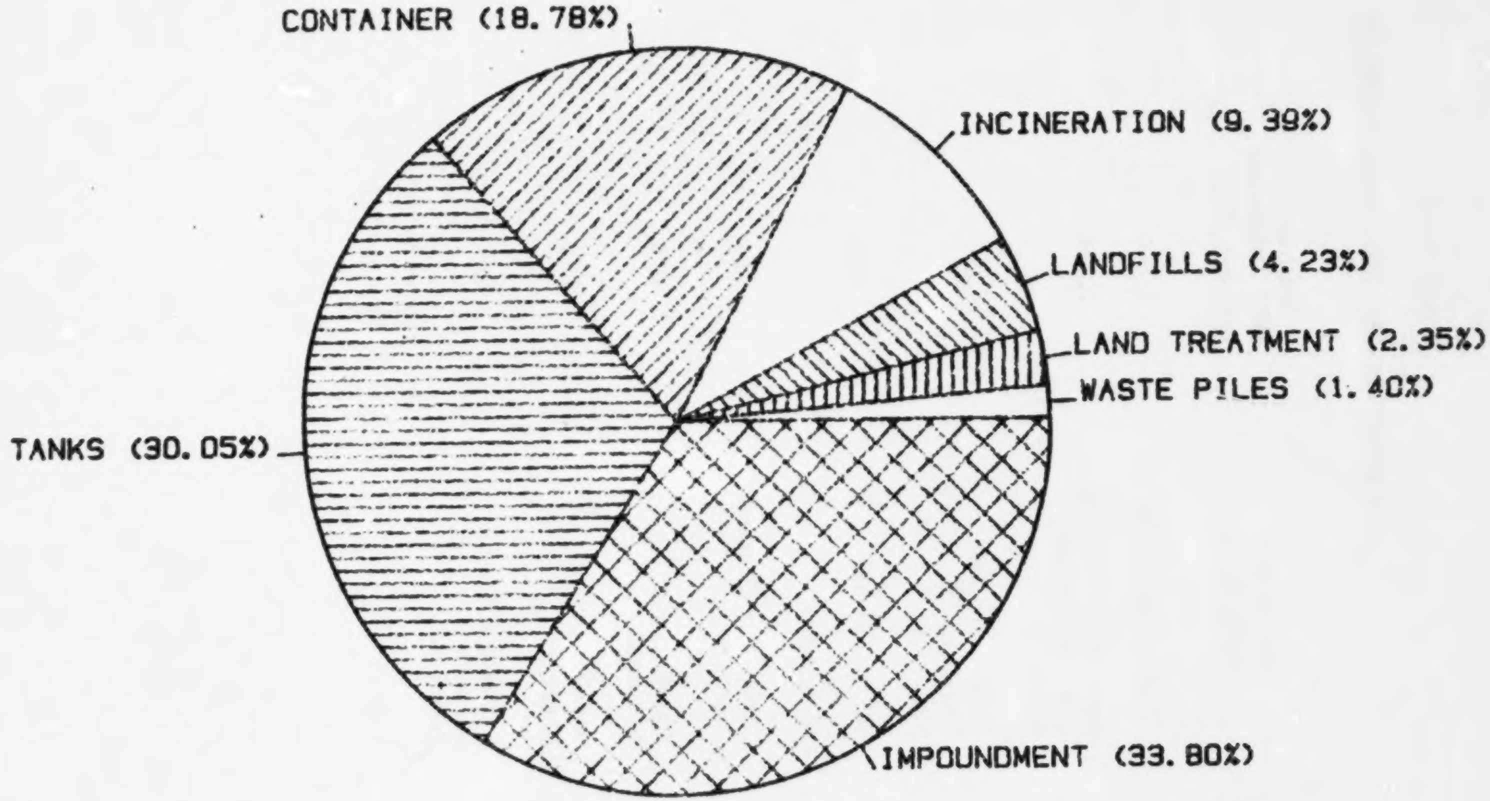
TABLE II-4

DISTRIBUTION BY INDUSTRIAL CATEGORY

Industrial Category	Estimated 1983 Injection Volume (MGY)	Percent of Total Annual Volume
Organic Chemical	5,868	50.86
Petroleum Refining & Petrochemical Products	2,888	25.03
Miscellaneous Chemical Products	687	5.95
Agricultural Chemical Products	525	4.55
Inorganic Chemical Products	254	2.20
Commercial Disposal	475	4.12
Metals and Minerals	672	5.82
Aerospace & Related Industry	169	1.47
Totals	11,539 (MGY)	100%

Figure II-7

SURFACE FACILITIES IN HW INJ. SITES
TOTAL 112 SITES



Chapter III

Hydrogeologic Environment

3.1 Introduction

3.1.1 Geohydrologic Considerations

Knowledge of the regional and site-specific geologic and hydrologic characteristics is fundamental to the evaluation of the suitability of the site for injection. These characteristics also influence the design, construction, operation and monitoring methods chosen for each particular well. In defining the geologic environment, the subsurface rock units are described in terms of their lithology, thickness, areal distribution, structural configuration, engineering properties, and potential resource value. The chemical and physical properties of subsurface fluids and flow systems which comprise the hydrologic environment must also be defined.

3.1.2 General Geology

Geology is the study of the earth and its processes. The rocks of which the earth is composed are described in terms of their origin and lithology, which refers to their composition and texture. By origin, rocks are classified as igneous, metamorphic and sedimentary. While nearly all rock types can, under certain circumstances, serve as injection zones, sedimentary rocks are most likely to have suitable geologic and engineering characteristics. Sufficient porosity, permeability, thickness and areal extent are needed to permit the rock to act as a liquid-storage reservoir at safe injection pressures.

The folding and fracturing of these rocks is also of concern to the well builder. Structural geologic characteristics on a regional and local scale are significant because of their role in influencing: 1) subsurface fluid flow; 2) the engineering properties of rocks; 3) the localization of mineral deposits; and 4) earthquakes. The two basic kinds of folds are synclines (downward or trough-like folds) and anticlines (upward folds). Synclinal basins of a regional scale (hundreds of miles) are viewed as particularly favorable for injection. Faults are fractures in a rock sequence along which there has been displacement of the two sides relative to one another. Faults may act either as barriers or as channels to fluid movement.

3.2 Regional Geologic Findings

Selection of an environmentally acceptable site is critical for Class I hazardous waste injection wells. The choice of an injection site begins with an evaluation at the regional level, then is narrowed to the vicinity of the site and finally focuses upon the immediate well location.

In general terms, geologic characteristics divide the United States into regions. Synclinal sedimentary basins with thick clastic wedges, such as the Michigan Basin and Gulf Coast (Figure III-1), are particularly favorable sites for Class I wells. They contain relatively thick sequences of saltwater-bearing sedimentary rocks and the subsurface geology of these basins is well known. Where sedimentary rock cover is absent, or thin, these areas are generally not suitable for Class I injection wells. Regions shown in Figure III-1 where a thick volcanic sequence lies at the surface are also usually unfavorable as sites. To the west, the immense and geologically complex Basin and Range Province is a series of narrow basins and intervening, structurally positive ranges. Some of the basins might provide injection sites, but their geology is mostly unknown. The geology of the West Coast is relatively complex in which some tertiary sedimentary basins (that yield large quantities of oil and gas) could be geologically satisfactory sites for Class I injection wells. In general most of the HW injection wells are located in either the sedimentary basin of the Great Lakes area or the Gulf Coast.

3.3 Local Geologic Findings

3.3.1 Lithological

To predict the performance of injection wells and their effect on the environment, the local hydrogeological data must be estimated prior to well construction, and the actual geologic characteristics and values for rock and fluid properties determined during well construction and testing. A wealth of subsurface geologic and engineering information can be obtained during the drilling and the testing of any well. The extent to which information can be obtained depends on the availability of existing data in the immediate vicinity of the well. At a site where no wells have previously been drilled within miles, it may be necessary to collect all the important information during installation of a test boring or well, if feasible.

In a local site evaluation the geological characteristics of the injection zone should be examined. In this study, the injection zone refers to the lithologic formation or part of formation in which the injection occurs. The desired characteristics of such a zone are:

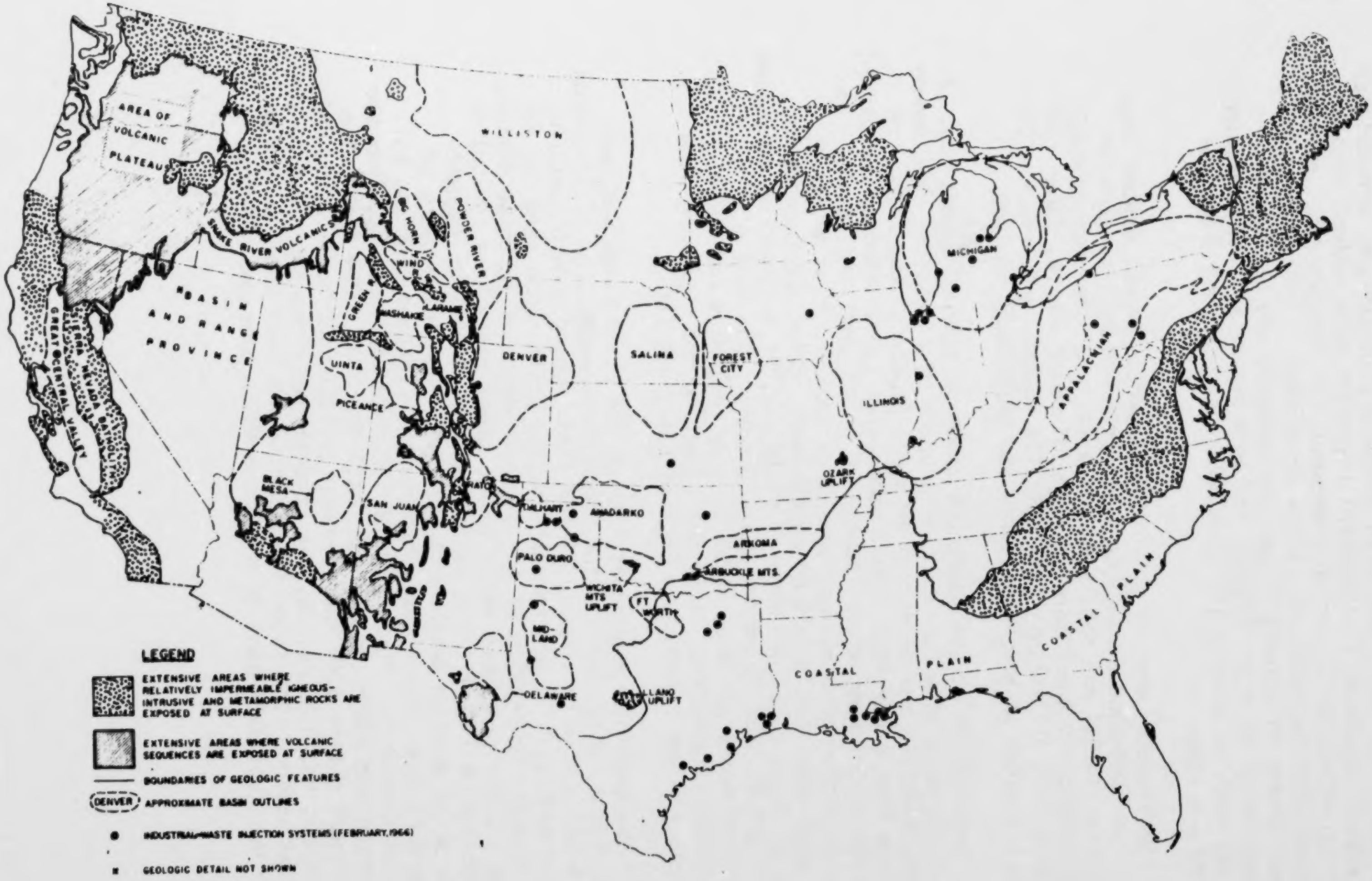

AREA OF VOLCANIC PLATEAU
SNAKE RIVER VOLCANICS
BASIN AND RANGE PROVINCE
SIERRA NEVADA BATHOLITH
GREAT CENTRAL VALLEY
WILLISTON
BIG HORN
POWDER RIVER
WIND R.
GREEN R.
WASHAKIE
LARAMIE
UINTA
PICEANCE
DENVER
BLACK MESA
SAN JUAN
RATON
DALHART
ANADARKO
PALO DURO
WICHITA MTS UPLIFT
MID-LAND
DELAWARE
LLANO UPLIFT
FT WORTH
ARKOMA
ARBUCKLE MTS
SALINA
FOREST CITY
OZARK UPLIFT
ILLINOIS
MICHIGAN
APPALACHIAN
COASTAL PLAIN
COASTAL PLAIN
LEGEND
EXTENSIVE AREAS WHERE RELATIVELY IMPERMEABLE IGNEOUS-INTRUSIVE AND METAMORPHIC ROCKS ARE EXPOSED AT SURFACE
EXTENSIVE AREAS WHERE VOLCANIC SEQUENCES ARE EXPOSED AT SURFACE
BOUNDARIES OF GEOLOGIC FEATURES
DENVER APPROXIMATE BASIN OUTLINES
● INDUSTRIAL-WASTE INJECTION SYSTEMS (FEBRUARY, 1966)
■ GEOLOGIC DETAIL NOT SHOWN

FIGURE III-1 GEOLOGIC FEATURES SIGNIFICANT IN DEEP WASTE-INJECTION WELL-SITE EVALUATION, AND LOCATIONS OF INDUSTRIAL-WASTE INJECTION SYSTEMS
"Warner, P.L., AAPG Memoir No. 10, AAPG, p. 11, 1968"

(1) sufficient thickness, with adequate porosity and permeability to accept liquid at the proposed injection rate without necessitating excessive injection pressures; (2) homogeneous lithology without high permeability lenses or streaks; (3) large enough areal extent to minimize injection pressure and prevent the injection fluid from reaching recharge areas; and (4) confining strata with relatively low permeabilities over and under the injection zone.

Nationwide, most of the injection wells inject wastes into sand and sandstone formations (76%) followed by limestone or dolomite (14.3%) and sandstone shale (9.7%). The most commonly used formations for hazardous waste disposal are Mt. Simon (32 wells), Frio (17 wells), Catahoula (14 wells), and Arbuckle (15 wells) located in the Great Lakes and Gulf Coast regions.

Examination of the confining zones is also of importance. A confining zone is a formation or a group of formations that immediately overlies the injection zone and separates the injection horizon from other formations, especially the lowermost underground sources of drinking water (bottom of 10,000 mg/l TDS level). To provide a good seal against upward or downward flow of fluids, the confining zone should be sufficiently thick and impermeable. Most of these zones are made of shale (42.7%) followed by sandstone shale (20.8%) and limestone shale (10.0%). The rest of the confining zones are made of silt, clay, dolomite and other impermeable materials. Both the injection and confining zone lithologies are depicted in Figures III-2 and III-3.

The geologic characteristics of the Great Lakes and Gulf Coast areas, which contain the highest concentrations of hazardous waste wells, can be broadly generalized. These generalizations can be made with regard to wells in the Great Lakes area due to the relative homogenity of the geologic deposits in those States. Class I hazardous waste wells in the Great Lakes Area typically inject into 611-foot thick sandstones (Mt. Simon) or dolomite lying at an average depth of 2,462 feet. Confining zones of shale with some limestones, dolomite or siltstone averages 631 feet in thickness. The bottom of the USDW was separated from the injection horizon by an average total depth of 2,264 feet. The Gulf Coast states also share common geologic characteristics and therefore, the hydrogeology can be regionally characterized to a limited extent. The injection zone for the Gulf Coast States HW wells was typically sand or sandstone which averaged 502 feet in

FIGURE III-2

INJECTION ZONE LITHOLOGIES

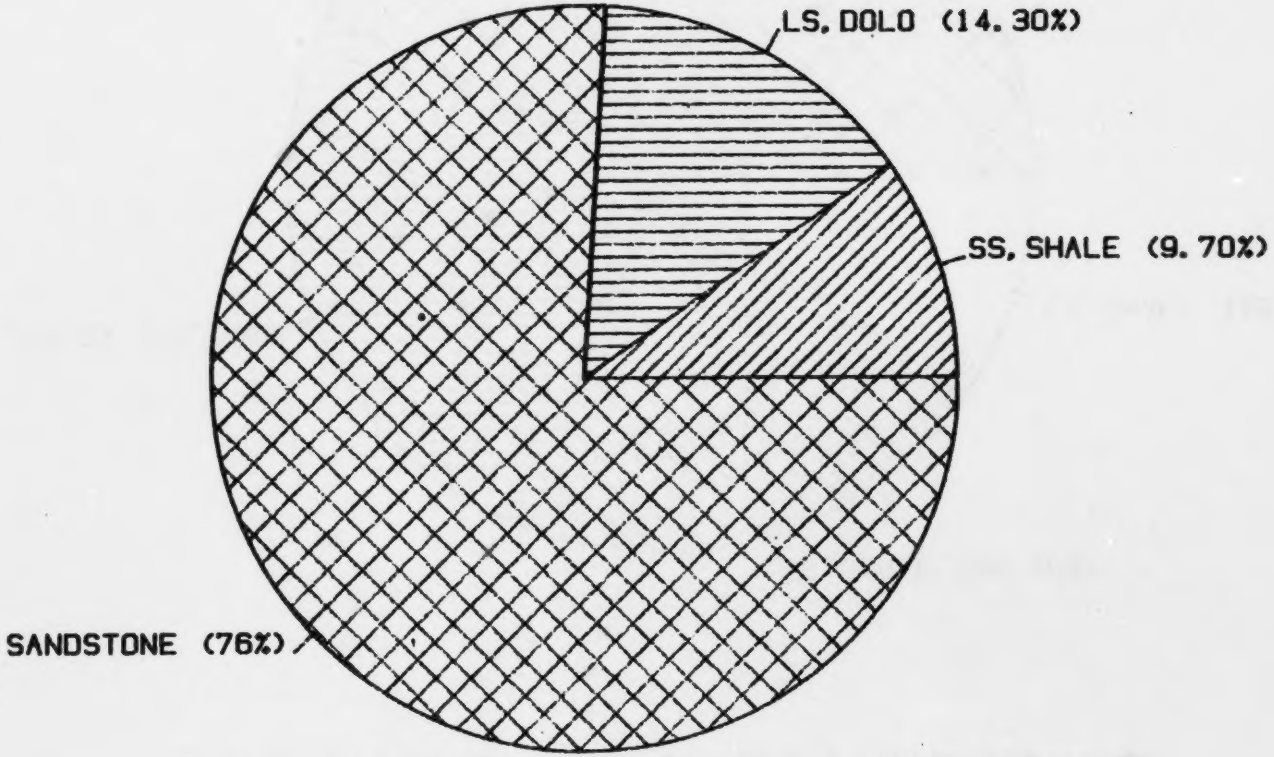
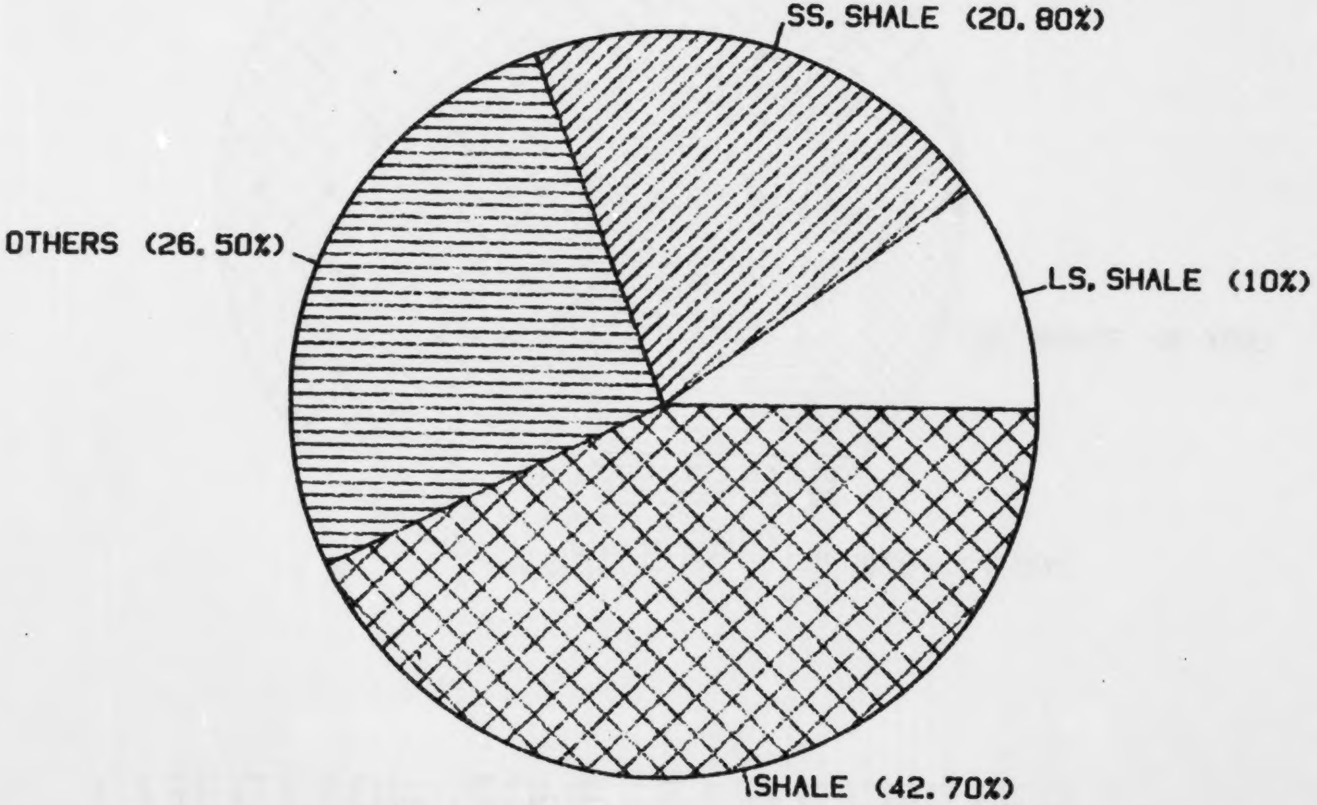


FIGURE III-3

CONFINING ZONE LITHOLOGIES



thickness and lie at an average depth of 4,572 feet. The confining zone is predominantly shale with some clay or marl averaging 990 feet in thickness. The average separation between the lowermost USDW and the injection horizon is 3,305 feet.

The average thickness, lithology and formation names for injection and confining zones for all hazardous waste wells are tabulated by State and presented in Table III-1 and III-2. The depth to the top of the injection zone averages 4,063 feet nationally, and the thickness of the injection interval averages 556 feet. The injection zones are separated from the bottom of the USDWs by an average, nationally, of 2,925 feet. The confining zone thickness averages 928 feet.

3.3.2 Structural

In addition to lithological concerns, the local structural geology of the site must be examined. Generally simple structural geologic conditions (i.e., reasonably free of complex folding and faulting) and an area of low seismic activity with a low probability of earthquake damage are desired.

3.4 Hydrology

The goal of the UIC program is to protect underground sources of drinking water (USDWs). According to the UIC Regulations (40 CFR § 146.03) water containing up to 10,000 ppm total dissolved solids (TDS) is considered a USDW. Whenever available, data was collected on the depth of both the 3,000 and 10,000 ppm TDS isopleths in the course of the Class I well inventory.

Table III-3 shows the most intensively used aquifers in the States in which Class I hazardous waste wells operate. As expected, most of these aquifers are alluvial in nature and located at very shallow depths. The depth and thickness of these aquifers are also provided whenever possible.

Figure III-4 compares the average depths of injection zones, USDWs, (base of 10,000 mg/l TDS) and their separations by State as computed from 178 wells. The data shows that in most instances there is good separation between the injection zone and the base of the 10,000 ppm TDS. In more than fifty percent of these wells this distance is more than 2,500 ft. There is of course greater separation from the base of 3,000 mg/l TDS water, the upper

TABLE III-1

INJECTION ZONE CHARACTERISTICS

State	Average Depth to Top of Injection Zone (ft)	Average Thickness of Injection Interval (ft)	Lithology	Formation Names
Alabama	4,095	72	ss, clay, marl	Naheola, Nanafalia
Alaska	2,032	115	sh, silt, ss	Tertiary, Sagavanirktok
Arkansas	2,867	108	ss, sh, clay	Graves, Tokio, Blossom, Meakins
California	6,139	751	ss, silt	Rio Bravo
Florida	2,067	513	ls	Cedar Keys, Lawson, Lower Floridan
Illinois	2,512	574	dol, ss, ls	Potosi, Eminence, Mt. Simon, Salem
Indiana	2,332	1,420	ss	Mt. Simon, Bethel, Eau Claire, Cypress, Tar Springs
Kansas	3,257	559	dol, ls chert	Arbuckle
Kentucky	3,115	2,590	dol.	Knox
Louisiana	3,627	281	ss, clay, silt	Hosston, Fleming, Sparta
Michigan	3,447	379	ss, ls, dol	Mt. Simon, Eau Claire, Dudee Traverse, Galesville, Franconia

TABLE III-1

INJECTION ZONE CHARACTERISTICS (cont'd.)

State	Average Depth to Top of Injection Zone (ft)	Average Thickness of Injection Interval (ft)	Lithology	Formation Names
Mississippi	4,413	1,212	ss	Hosston
Ohio	3,479	177	ss, dol	Mt. Simon, Maynardville Rome
Oklahoma	1,361	964	dol, ls, ss, chert	Arbuckle
Pennsylvania	1,611	70	ls	Boss Island
Texas	5,371	702	ss, clay, shale	Catahoula, Oakville, Frio, San Andres, Anahuac, Blossom, Jackson, Lower Granite Wash., Glorietta, Greta
National Average (By well)	4,063	556		

ss - sandstone
sh - shale
dol - dolomite
ls - limestone
silt - siltstone

TABLE III-2
CONFINING ZONE CHARACTERISTICS

State	Average Confining Zone Thickness (ft)	Lithology	Formation Names
Alabama	150	clay	
Alaska	1,500	ss	Permafrost
Arkansas	521	sh, marls, chalk	Saratoga, Annona, Brownstown, Ozan
California	700	ss, sh, silt	Freeman-Jewett, Valley Spring - Ione
Florida	311	clay, dol, anhy	Cedar Keys, Bucatunna
Illinois	319	sh, ls, dol, silt	Prarie du Chien, Maquikem, Maquoketa, New Albany, St. Genevieve
Indiana	256	ss, sh, silt	Eau Claire, Tar Springs
Kansas	3,089	ls, sh, ss	Wellington to Simpson
Kentucky	700	dol, ls	Trenton, Black R, Chazy
Louisiana	442	sh, clay ss, silt	Sligo, Burkeville, Fleming
Michigan	538	sh, dol, ls	Antrim, Prairie du Chien, Ellsworth, Bell, Bayport-Michigan
Mississippi	912	sh	
Ohio	1,254	dol, sh, ls	Eau Claire, Rochester, Rome, Tomstown
Oklahoma	83	sh, ls	Woodford, Chattanooga
Pennsylvania	395	sh, ls, chert	
Texas	1,442	sh, clay, ss	Anahau, Jasper, Beaumont, Oakville Lagarto, Lissie, Montgomery, Betty, Grayburg, Yates, Frio, Fleming, Burkeville, Anahuac, Glenrose
National Average (by well)	928		

62<

TABLE III-3

UNDERGROUND SOURCES OF DRINKING WATER (USDW) IN THE VICINITY OF CLASS I HW WELLS

State	USDW #1	USDW #1* Depth(ft) (Approx.)	USDW #1 Thickness Feet	USDW #2	USDW #2* Depth(ft) (Approx.)	USDW #2 Thickness Feet	USDW #3	USDW #3* Depth(ft) (Approx.)	USDW #3 Thickness Feet	USDW #4	USDW #4* Depth(ft) (Approx.)	USDW #4 Thickness Feet	USDW #5	USDW #5* Depth(ft) (Approx.)	USDW #5 Thickness Feet
AL	Alluvium	150	150	Miocene, Plrocene	800	650									
AK	None														
AR	Sparta Sand	600		Cane River Formation			Cockfield Formation								
CA	Kern River	2,500	2,500	Laguna Formation	240	265									
FL	Ocala	370	320	Avon Park	690	570	Lake City	1,260	650	Lower Floridan	1,730	360	Upper Floridan	1,150	220
IL	St.Peter Sandstone	1,474	118												
IN	Valparaiso	80	70	Silvrian	160	500	Kankakee	50	40	St.Peter Sandstone	1,113	352			
KS	Coffeyville	30	30	Alluvium/ Terrace		80									
KY	Alluvium	113	113												
LA	Gramercy Norco	270	145	Gonzales	412	427	Chicot	480	175						
MI	Coldwater Shale	448		Sunbury Shale	1,366										
MS	Cookfield Formation	180	208	Sparta Sand	458	402	Moody's Branch	154	26						
OH	Big Line	50	550	Ohio River Aquifer	26	48									
OK	Nowate	50	50	Oologah	75	110	Checkboard Limestone	36	4	Labette	140	200	Cleveland Sand	90	54
TX	Chicot	575	411	Lissie	450	550	Beaumont	400	300	Goliad	850	250	Evangeline	2,330	1,470

* Depths to top of USDW

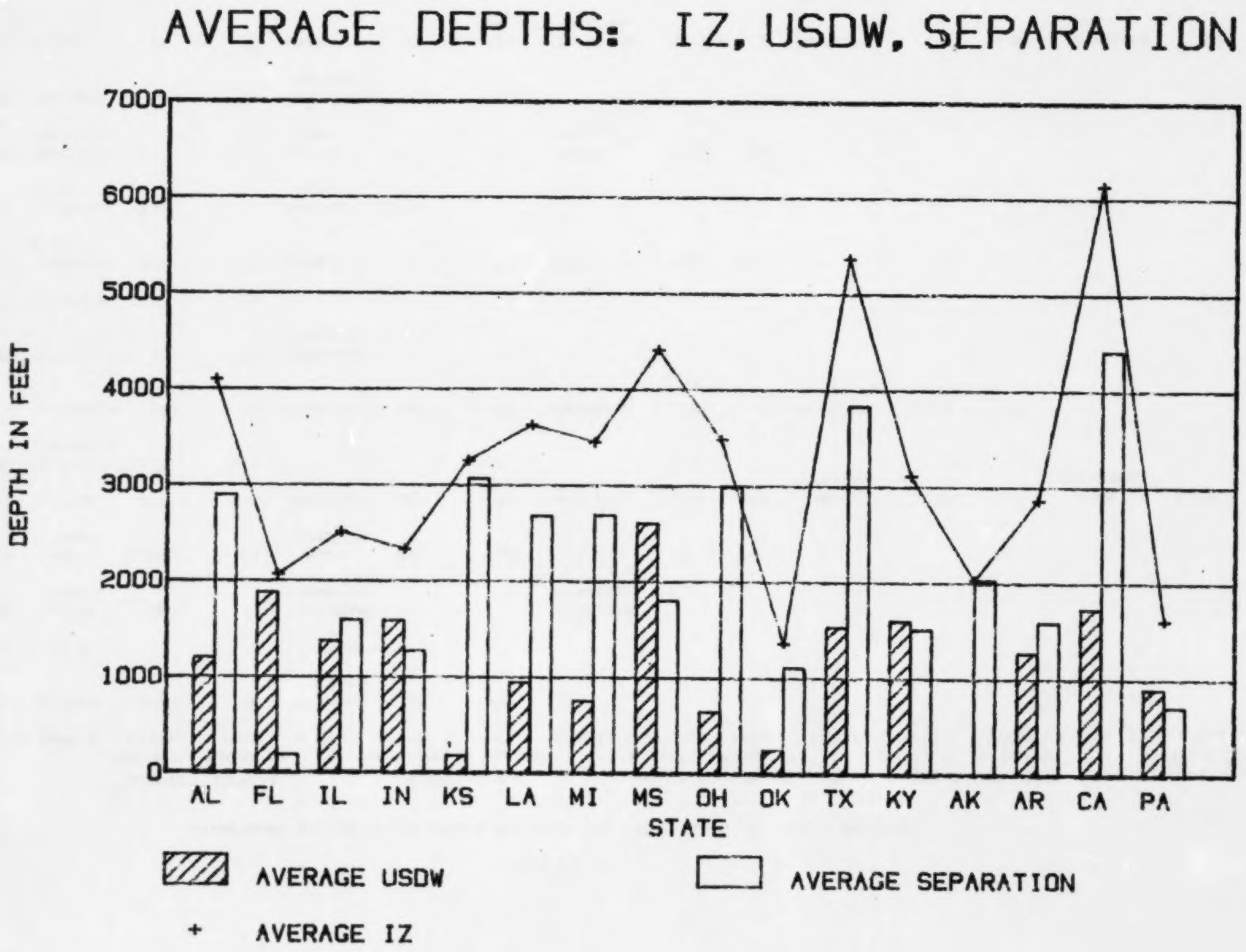

AVERAGE DEPTHS: IZ, USDW, SEPARATION
DEPTH IN FEET
7000
6000
5000
4000
3000
2000
1000
0
AL
FL
IL
IN
KS
LA
MI
MS
OH
OK
TX
KY
AK
AR
CA
PA
STATE
AVERAGE USDW
AVERAGE SEPARATION
+ AVERAGE IZ

Figure III-4

limit of water usually considered useable as a source of drinking water. This distance is greater than 2,500 ft. in approximately 63% of the wells in the inventory.

3.5 Other Considerations

3.5.1 Formation Fluid Considerations and Compatibility

In a local site evaluation, the nature of the formation fluid contained within the injection zone ideally must be considered. 1.) The slow lateral movement of the fluid (with its injected wastes) in the injection zone must be assured in order to prevent rapid movement of waste away from the injection site. 2.) The formation fluid pressure must be low to normal to limit rates of undesirable reactions (e.g., corrosion). 3.) The formation fluid should have no apparent economic value (i.e., not potable, unfit for industrial or agricultural use, or not containing minerals in economically recoverable quantities).

The design of an injection well must also (§ 146.15) account for injection and formation fluid interactions. These interactions may lead to severe reduction in formation permeability or to a loss of structural integrity within the formation itself. Waste and formation compatibility problems are specific to the particular formation and waste involved, and the prediction of their compatibility requires site-specific studies. Specific problems associated with compatibility include plugging of the injection formation with suspended solids, precipitation and polymerization of the waste fluid which reduces permeability , and alteration of the injection or confining formation matrix.

In some cases, the injection fluid may react directly with the rock matrix. One common problem is the swelling of clays from contact with the injection fluid. Affected clays can significantly reduce the permeability of the formation. In other instances, polar-organic compounds can be adsorbed by the rocks, particularly silicates, and can significantly reduce the permeability of the formation.

The injection of acids may result in dissolution of the rock matrix. In the case of certain cemented material, dissolution can result in the migration of particles which then block pore spaces and reduce the injection zone permeability. Dissolution of the confining formation can allow the migration of injection fluid out of the injection formation.

To avoid interaction problems, the injection and confining formations should have their respective formation fluid and rock matrices tested, by column studies for example, for compatibility with the proposed injection (or similar) fluid. Drilling a

65<

borehole offers an excellent opportunity to collect data from drill cuttings, cores, and fluid samples on a number of important parameters of the formations to be penetrated.

Table III-4 lists the chemical and physical determinations that may be made for the naturally occurring water in an injection zone. The routine determinations characterize the general geochemical nature of the water. The additional analyses suggested for an injection zone are for the purpose of predicting the reactivity of that water with the injection fluid, and would be selected on the basis of reactions that are suggested by the chemistry of the two fluids. Samples of water taken from shallow fresh-water aquifers should be analyzed more completely for minor elements so that their baseline quality is well established and the presence of any introduced contaminants can be detected.

In some cases, compatibility problems can be prevented by pretreatment of the waste. The most common pre-injection treatment used to ensure compatibility is filtration. This measure was employed at fourteen of the twenty facilities visited. Four of these fourteen facilities did not perform compatibility tests but practiced filtration only as a precaution against incompatibility. Of the fourteen facilities, seven also adjusted the pH of the effluent prior to injection to minimize precipitation of solids. Three of the seven injected a buffer solution prior to injecting waste to separate it from the formation fluid in an attempt to eliminate solids precipitation. Five of the fourteen also removed oil or volatiles to avoid lowering the permeability of the injection formation. Some of these facilities employed more than one measure in addition to filtration.

The six facilities that did not practice any pre-injection treatment have concluded, based on tests and/or analyses, that compatibility exists without treatment.

This study found that the compatibility of the hydrogeological environment as it relates to precipitation appeared to be satisfactory. However, little information was available concerning other chemical reactions that can take place in the subsurface environment. From the available information, there is some evidence that extreme care should be taken when injecting acid into a carbonate formation. The subsequent formation of carbon dioxide from the interaction of the acid with carbonate may interfere with the operation of the well and may ultimately cause a "blow-out". In at least two facilities (Cabot in Illinois and Hercafina in North Carolina) poor operation led to well blow-outs.

TABLE III-4

COMMON WATER ANALYSES PERFORMED ON SUBSURFACE WATER SAMPLES

(*Warner, D.C. and Lehr, J.H.: An Introduction to the
Technology of Subsurface Waste water Injection
EPA-600/2-77-240, December, 1977)

Determination	Routine Analysis	Injection-Interval Water Analysis
Alkalinity	X	X
Aluminum		X
Barium		X
Calcium	X	X
Chloride	X	X
Hydrogen ion(pH)	X	X
Iron	X	X
Magnesium	X	X
Manganese		X
Potassium	X	X
Sodium	X	X
Specific Conductance	X	X
Specific gravity	X	X
Sulfate	X	X
Total Dissolved Solids	X	X

3.5.2 Water Supply Wells

Another important siting consideration is the dependence of the area on ground water. The number of water wells and especially the number of public water supply wells in the area give a good idea of the degree of this dependence. These water wells should be inventoried according to their number, depth, type, pumping rate, and proximity to the proposed injection well. These inventories plus additional data are available on most municipal water supply wells.

The assessment team collected information on the location and names of all water well owners within a 5 mile radius (80 square miles) of hazardous waste injection wells. Because this information was not regularly required by State agencies in reviewing HW well permit applications, it was not readily available. Much of the drinking water well information was obtained by identifying residences on a county street map or from other indirect sources.

Table III-5 summarizes the data obtained on all Class I HW wells as relative to the presence of public and private water supply wells within a five mile radius. The average number of water supply wells of all types in the vicinity of injection wells are presented for each State. Wherever known, the percentage of public water supply wells is provided.

Though Florida has a greater number of water supply wells located within a five mile radius of HW wells than any other State, this is primarily the result of one facility where 2,700 wells were located within a five mile radius.

A special note related to this data is warranted. Much of the information collected is inconclusive, and, therefore, some caution needs to be applied when attempting to interpret this data. Some data for the wells in the Great Lakes States were not available or could not be inferred from the information obtained. Other data were, at best, preliminary.

3.5.3 Wells in the Area of Review

Of concern in considering Class I hazardous waste well siting is the presence of any wells which penetrate the proposed injection zone within the area of review (AOR) of a Class I well. The area of review is defined in 40 CFR 146.06 as the zone of endangering influence in terms of disposal zone hydrology and injection well hydraulics. Federal regulation sets a minimum AOR of one-quarter mile radius or the radius resulting from the application of a representative physical model. It is recognized

TABLE III-5

WELLS IN THE VICINITY OF CLASS I HW WELLS

State	Average Number of Water Supply Wells in 5 Mile Radius of Class I Wells*	Percent Manicipal Water Supply Wells*	Average Number Wells In AOR**	Percent of Abandoned Wells in AOR
AL	30	-	5	-
AK	0	0	24	0
AR	28	-	3	67
CA	2	-	36	30
FL	2,764	-	0	0
IN	17	-	3	36
KS	-	-	5	60
KY	215	-	0	0
LA	31	13	29	37
MI	7	-	2	100
MS	-	-	0	-
OH	-	-	4	16
OK	5	0	44	93
TX	110	-	34	43

* These are water wells which do not penetrate the disposal zone.

** AOR - "Area of Review", which is a radius extending from the well bore. This radius is 1/4 mile at the minimum, but varies from state to state.

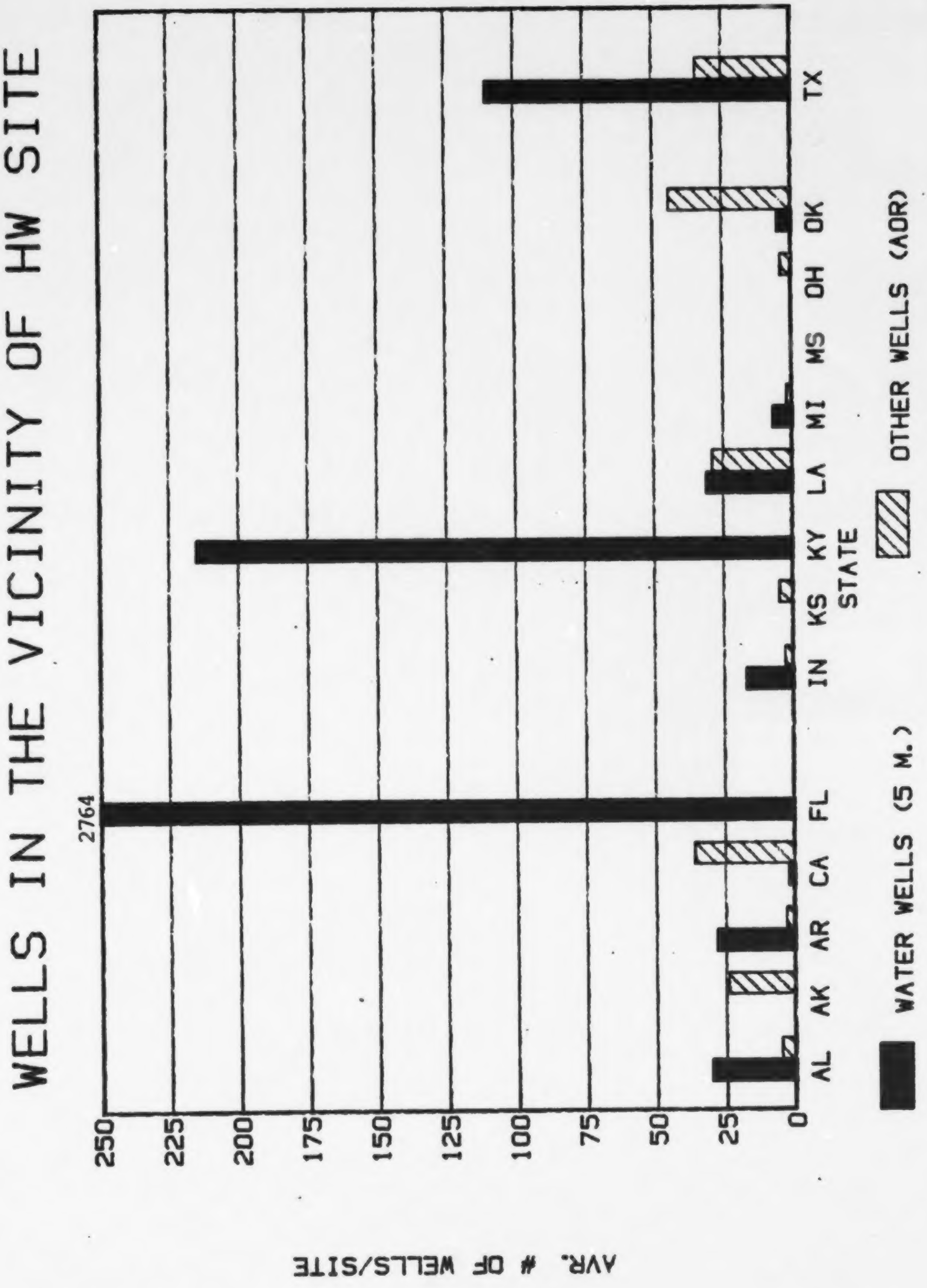
Only wells penetrating the disposal zone in the AOR are included.

(-) - No information available

that individual state agencies may vary in their interpretation of "area of review." Data obtained in this study reflect this variance.

Even a properly completed and cemented Class I well can pose a substantial contamination risk, if there are improperly abandoned wells or active injection or production wells which penetrate through confining layers. An improperly plugged or actively pumping well can become an alternate avenue for injected wastes diverting them to an underground source of drinking water instead of the intended receiving zone. Table III-5 also presents the average number of wells in the area of review of HW wells in each state. Where it could be determined, the percent of abandoned wells are also presented. This is represented graphically in Figure III-5. On the average, it appears that not only are there more wells within the area of review in Oklahoma, but that a great percentage of them have been abandoned.

Figure III-5


WELLS IN THE VICINITY OF HW SITE
2764
250
225
200
175
150
125
100
75
50
25
0
AL
AK
AR
CA
FL
IN
KS
KY
LA
MI
MS
OH
OK
TX
STATE
AVR. # OF WELLS/SITE
WATER WELLS (5 M.)
OTHER WELLS (AOR)

CHAPTER IV

WELL CONSTRUCTION AND EVALUATION

4.1 Drilling Technology

Various methods are used to drill injection wells. The choice of drilling method depends upon the purpose of the well, the geology of the well site, the character of the formations to be drilled, the depth of the injection zone, the availability of drilling equipment, and other site-specific factors such as total well depth, the lithology of the injection and confining intervals, the location of the fresh-water bearing aquifers and the location of any possible mineral resources.

The three major methods used for drilling are the cable-tool method, the rotary method, and the reverse-rotary method. Figure IV-1 shows the components of a rotary drilling operation. This method is today the most widely used for drilling injection wells.

4.2 Well Construction Techniques

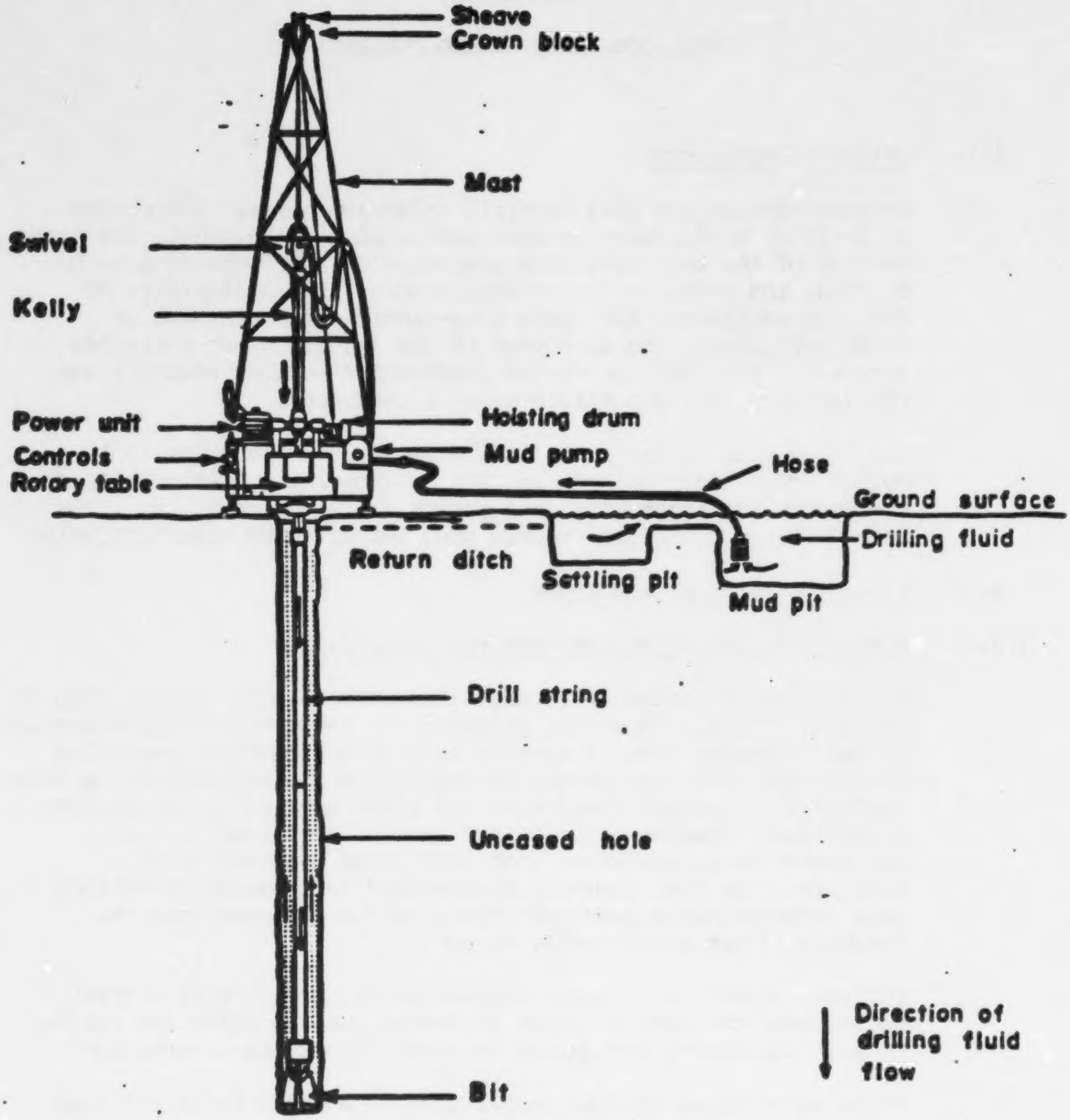
4.2.1 Bottom-Hole and Injection Interval Completion

Selection of a bottom-hole completion method is an initial step in planning a well. Depending primarily on the geologic characteristics of the injection zone, a wide variety of bottom-hole completion methods are used, but generally methods can be categorized as those applied to competent formations and those applied to incompetent formations. Competent formations include limestone, dolomite, and consolidated sandstone that will stand unsupported in a borehole. The most commonly encountered incompetent formations were unconsolidated sand and gravel that would cave into the borehole if not artificially supported.

The term injection interval completion is used in this context to indicate the configuration or device used to allow the fluids to exit the tubing and casing to enter the disposal formation.

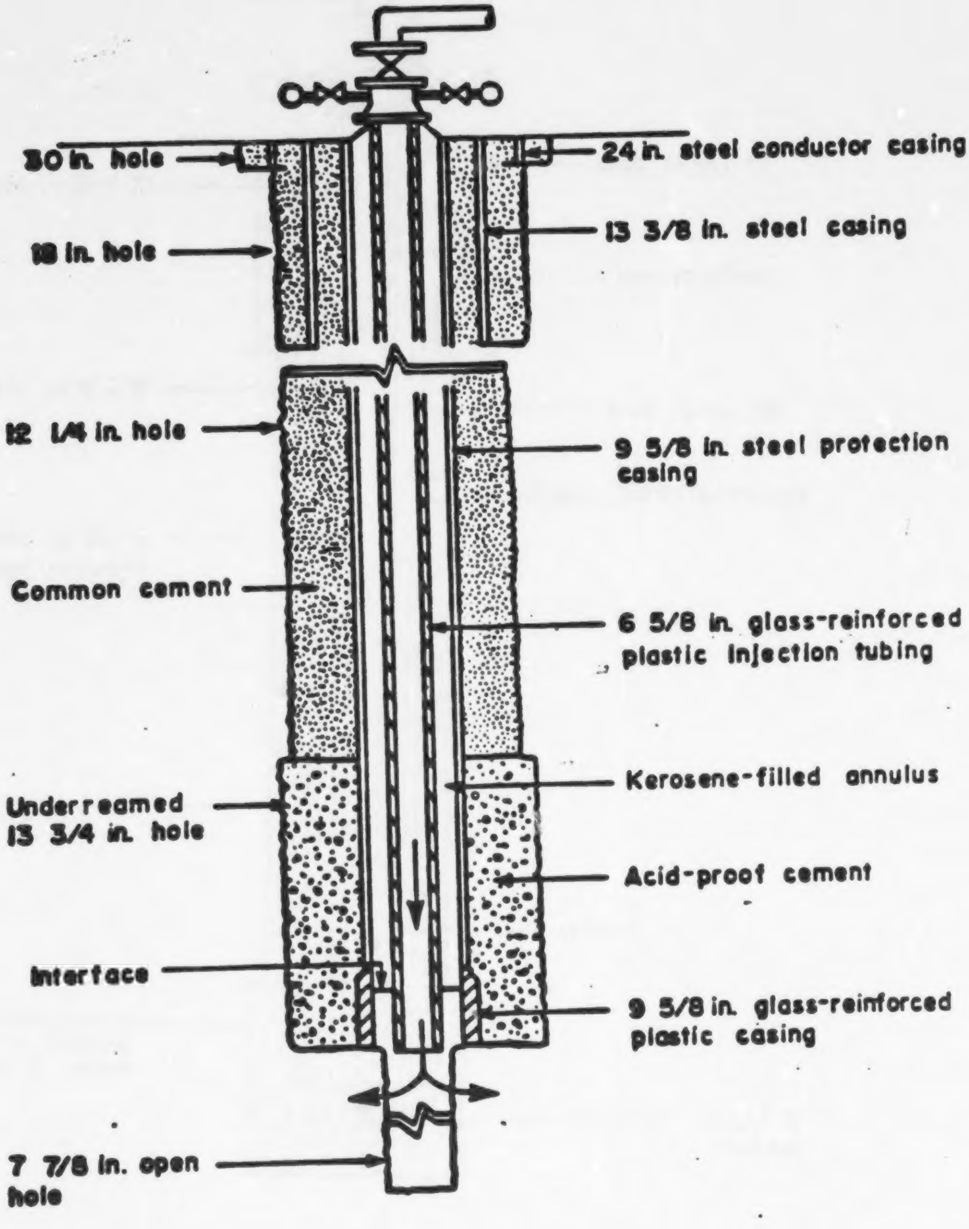
Three major types of well completions were found to be utilized in the HW hazardous waste (HW) injection wells -- open hole (Fig. IV-2), screened (Fig. IV-3), and perforated (Fig. IV-4).

Figure IV-1


Sheave
Crown block
Mast
Swivel
Kelly
Power unit
Controls
Rotary table
Hoisting drum
Mud pump
Hose
Ground surface
Drilling fluid
Return ditch
Settling pit
Mud pit
Drill string
Uncased hole
Direction of drilling fluid flow
Bit

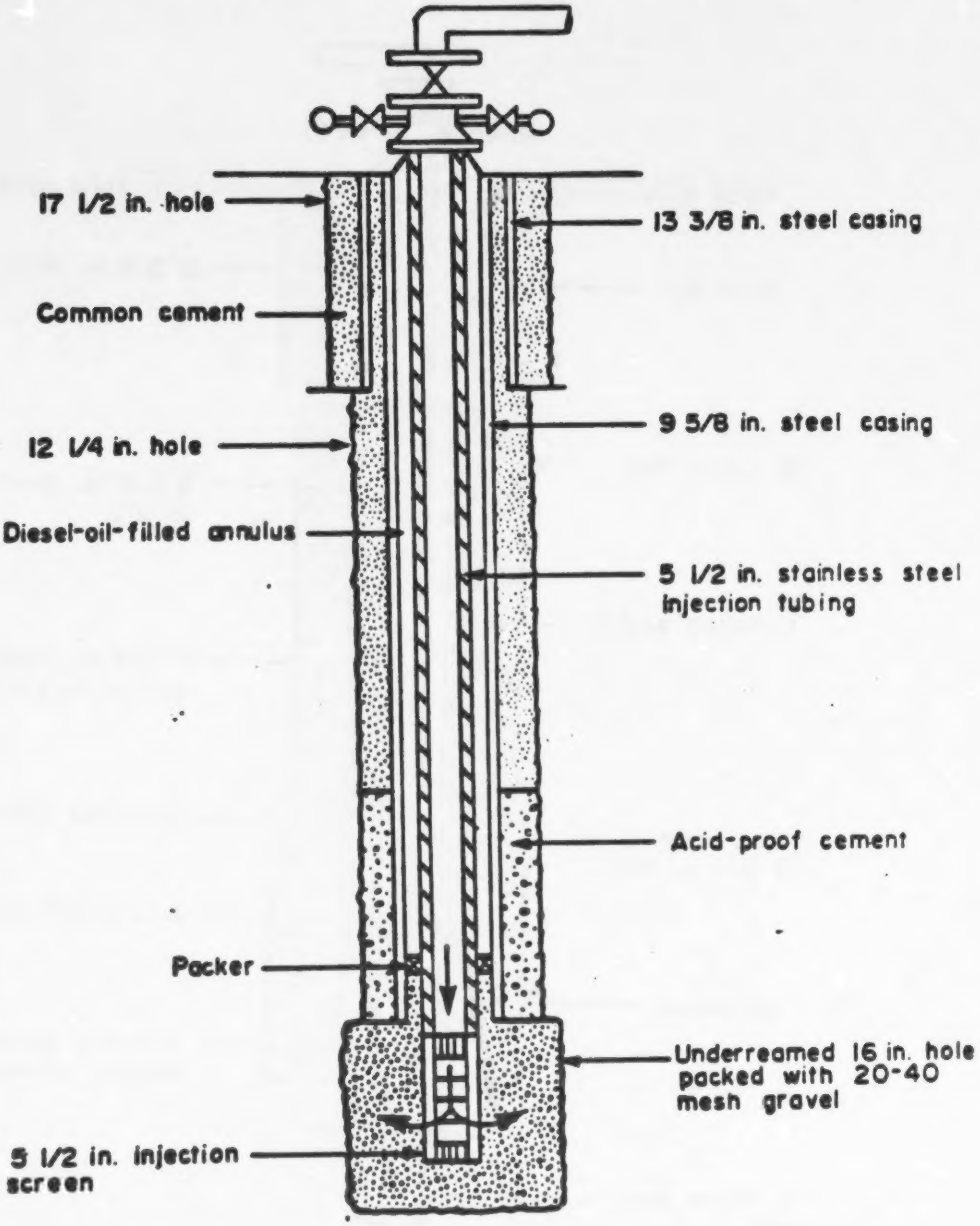
COMPONENTS OF THE ROTARY DRILLING OPERATION

FIGURE IV-2


30 in. hole
24 in. steel conductor casing
18 in. hole
13 3/8 in. steel casing
12 1/4 in. hole
9 5/8 in. steel protection casing
Common cement
6 5/8 in. glass-reinforced plastic injection tubing
Kerosene-filled annulus
Underreamed 13 3/4 in. hole
Acid-proof cement
Interface
9 5/8 in. glass-reinforced plastic casing
7 7/8 in. open hole

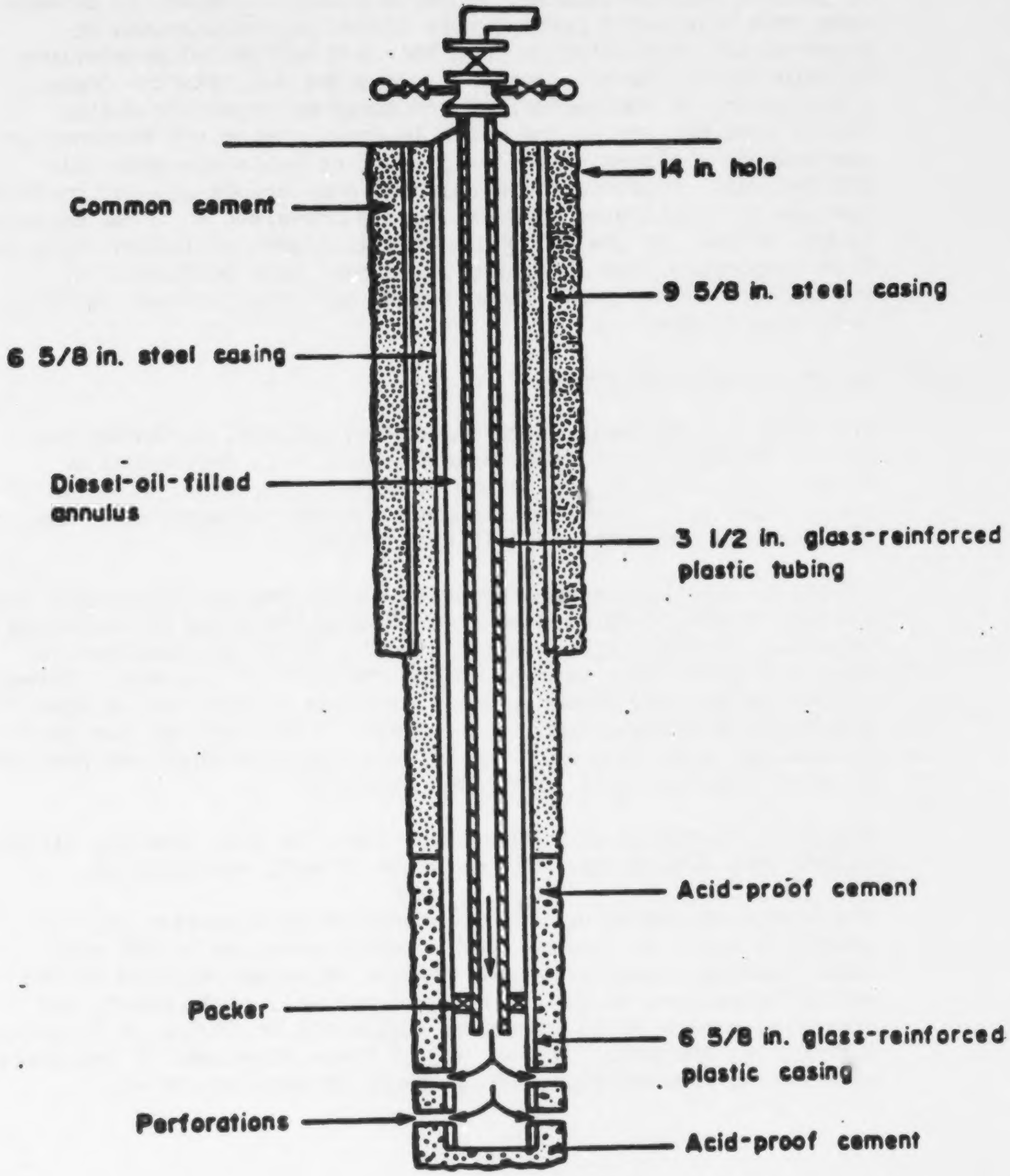
INJECTION WELL WITH OPEN HOLE COMPLETION

FIGURE IV-3


17 1/2 in. hole
13 3/8 in. steel casing
Common cement
12 1/4 in. hole
9 5/8 in. steel casing
Diesel-oil-filled annulus
5 1/2 in. stainless steel injection tubing
Acid-proof cement
Packer
Underreamed 16 in. hole packed with 20-40 mesh gravel
5 1/2 in. injection screen

INJECTION WELL WITH SCREENED BOTTOM

FIGURE IV-4


14 in. hole
Common cement
9 5/8 in. steel casing
6 5/8 in. steel casing
Diesel-oil-filled annulus
3 1/2 in. glass-reinforced plastic tubing
Acid-proof cement
Packer
6 5/8 in. glass-reinforced plastic casing
Perforations
Acid-proof cement

INJECTION WELL WITH PERFORATED BOTTOM

Nationwide, data was obtained for 229 HW injection wells of which 53 percent were perforated, 18 percent were screened, 27 percent were open hole and 2 percent were listed as combinations of screened and perforated or open hole and perforated completions (Figure IV-5). Texas, Louisiana, Oklahoma and Arkansas contain the majority of the perforated and screened injection wells. Ninety five percent of the wells in these States are screened or perforated; the remaining five percent of wells are open hole completions. Screened and perforated completions are appropriate for the unconsolidated bedrock geology prevalent in these regions. Eighty percent of the wells in Ohio, Michigan and Indiana have open hole completion, the remaining 20 percent have perforated or combination of the two. These States have the greatest majority of open hole completions.

4.2.2 Casing, Tubing and Packer

The selection of casing size and casing material is determined before drilling is begun. Casing selection is influenced by several variables including the setting depth, total diameter of the drilled well, formation temperature and pressure, and quantity and chemical composition of injected fluid.

Casing is used to prevent the hole from caving and to prevent contamination of underground sources of drinking water by confining injection fluids inside. Many injection wells are constructed with more than one string of casing cemented in the hole. Three casing strings are commonly used: surface string, one or more intermediate strings, and long string. Conductor pipe and liner strings may also be used. The various casing strings are described in most injection well technology manuals.

Casing is installed in stages where there is more than one string. Figure IV-6 depicts the various steps in well construction.

The design of casing used in constructing an injection well is generally based on internal and external pressure on the well, axial loading (compressive and tensile stresses) exerted on the well, temperature of injection fluid and well environment, and corrosive action of in injection fluids and/or fluids or formations surrounding the well. Any or all of these stresses, if incompatible with casing characteristics, can cause failure of the well.

FIGURE IV-5

WELL COMPLETIONS

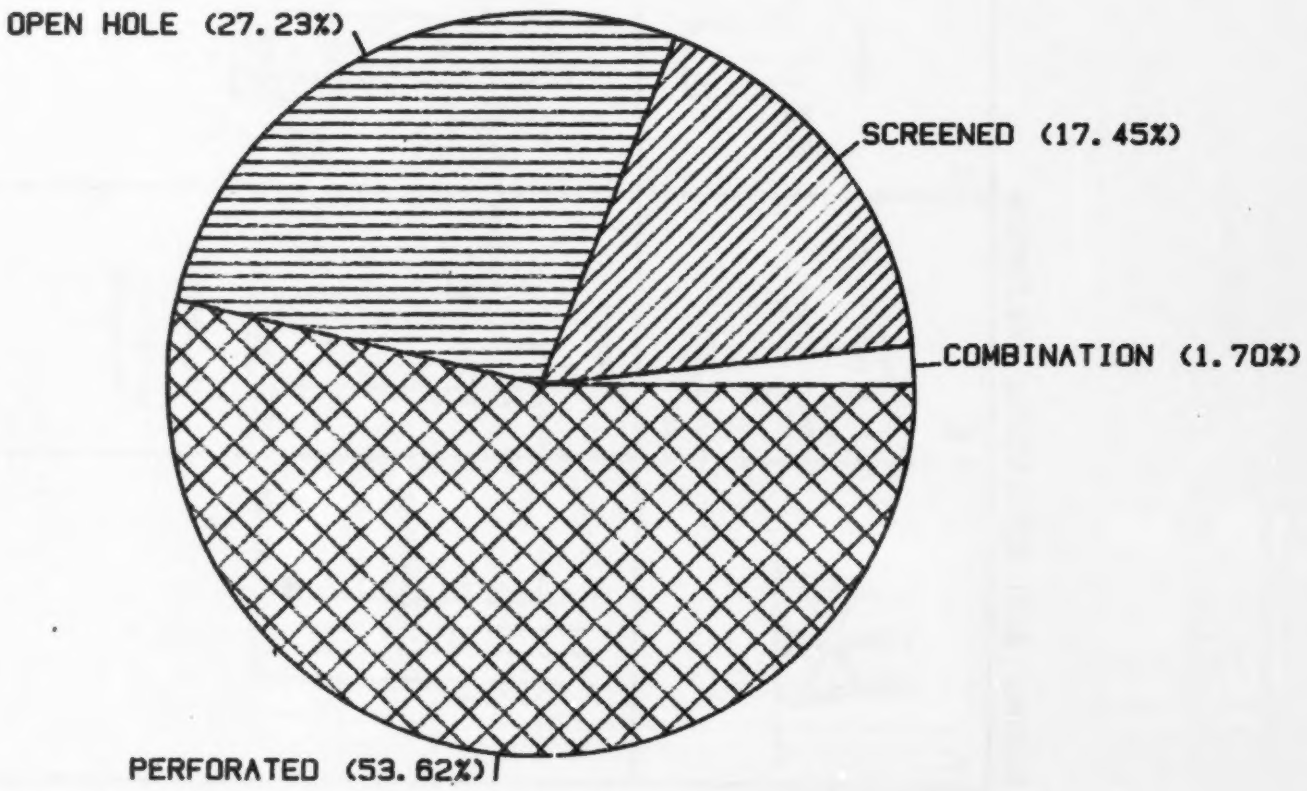
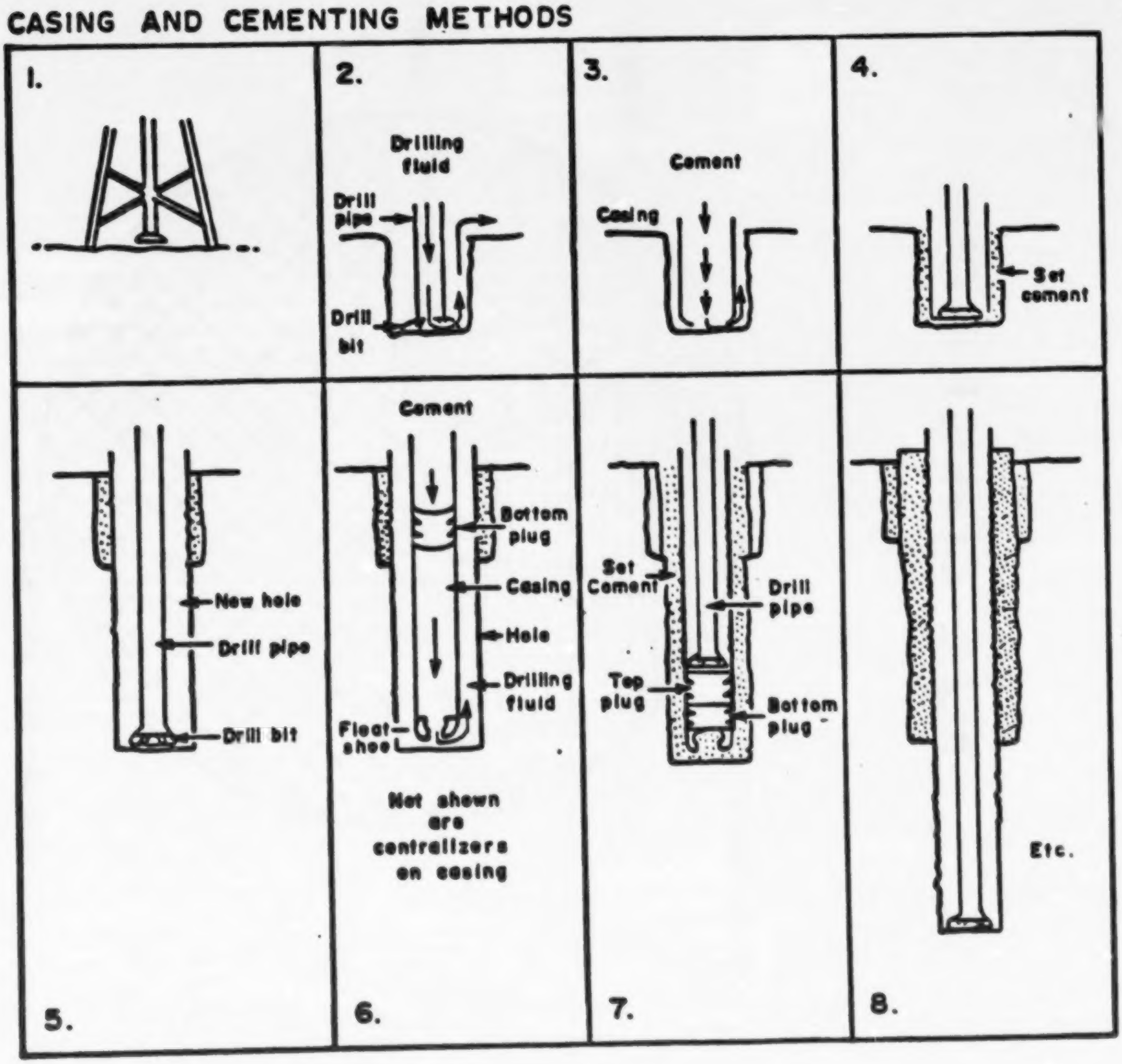


FIGURE IV-6


CASING AND CEMENTING METHODS
1.
2.
Drilling fluid
Drill pipe
Drill bit
3.
Cement
Casing
4.
Set cement
5.
New hole
Drill pipe
Drill bit
6.
Cement
Bottom plug
Casing
Hole
Drilling fluid
Float shoe
Not shown are centralizers on casing
7.
Set Cement
Drill pipe
Top plug
Bottom plug
8.
Etc.

SCHEMATIC DIAGRAM SHOWING WELL CONSTRUCTION STEPS

The most commonly used material for casing is steel. The American Petroleum Institute (API) has developed specifications for numerous physical requirements, including minimum yield strength, restricted yield strength, and chemical characteristics and properties of casing material. These specifications are widely used by the drilling industry.

The corrosion rate of steel casing is highly dependent upon the environment surrounding the well and the chemical characteristics of the injection fluid. Therefore, materials that are highly corrosion resistant and well suited for such environments are usually designed into the construction of a well. Although many of these materials are quite expensive, their use may ultimately prove economical, particularly for the bottom-most strings which contact the injection zone directly.

Plastic casing is also commonly used. Two major groups of plastic casing have been developed which are applicable to injection well completion: thermoset plastic and thermoplastic. Thermoset plastics include epoxy and vinyl-epoxy resins which can be reinforced with fiberglass. Thermoplastics, on the other hand, can be formed and reformed repeatedly by the application of heat followed by cooling. Thermoplastics include acrylonitrile-butadienestyrene (ABS), polyvinyl chloride (PVC), chlorinated PVC (CPVC), and styrene rubber (SR). The most commonly used thermoset casings consist of epoxy-resin fiberglass-reinforced material.

With respect to corrosion resistance, thermoset and thermoplastic materials are uniquely superior to metallic materials, because they are not susceptible to corrosion by galvanic and electrochemical effects. They are also resistant to chemical attack by oil and water and are unaffected by microbial agents. However, such materials may be susceptible to organic solvents such as acetone, methyl-ethyl ketone, toluene, trichloroethylene, turpentine, and xylene. Fibergalss reinforced plastic tubing has been found to be prone to chemical attack, unless it is coated with a fiber of special inert polymer.

This study found that HW injection wells utilized several methods of design and construction and generally involved two or three strings of casing and one of three completion methods. All HW wells have a minimum of two strings of casing that combined, extend to at least the top of the injection zone.

Ninety-five percent of the wells inventoried had data on surface casing; no data on the casings was available for the remaining 5%. In the wells with available TDS data, the surface casing is set to below a depth corresponding to ground-water TDS concentration of 3,000 mg/l in 66 percent of the cases and of 10,000 mg/l in 57% of the cases.

Sixty-eight percent of the injection wells were completed with long string and averaged a depth of 3,585 feet, and 32 percent were completed with intermediate string and averaged 3,134 feet deep.

Approximately 35 percent of the active wells that were visited had three (3) strings of casing: a surface, intermediate, and long string. However, all wells had surface casing and a long string or intermediate casing. Some of the wells did not have the long string running continuous to the surface, but overlapping to the intermediate string.

Most casing was constructed of carbon steel with a minimum yield strength of 55,000 psi (J-55). Figure IV-7 portrays the casing materials used that were found in HW wells. The casing weights varied between 14 pounds per foot to 94 pounds per foot. The heavier weight casings were found in the surface casing.

The average injection tubing size is 5.5 inches. Tubing material varies with specific injected fluids and pressures. Of the wells with tubing material information, 66 percent used steel of various API grades, 13 percent used fiberglass tubing, 10 percent used fibercast tubing, 5 percent used stainless steel tubing and 6 percent used specialized material tubing.

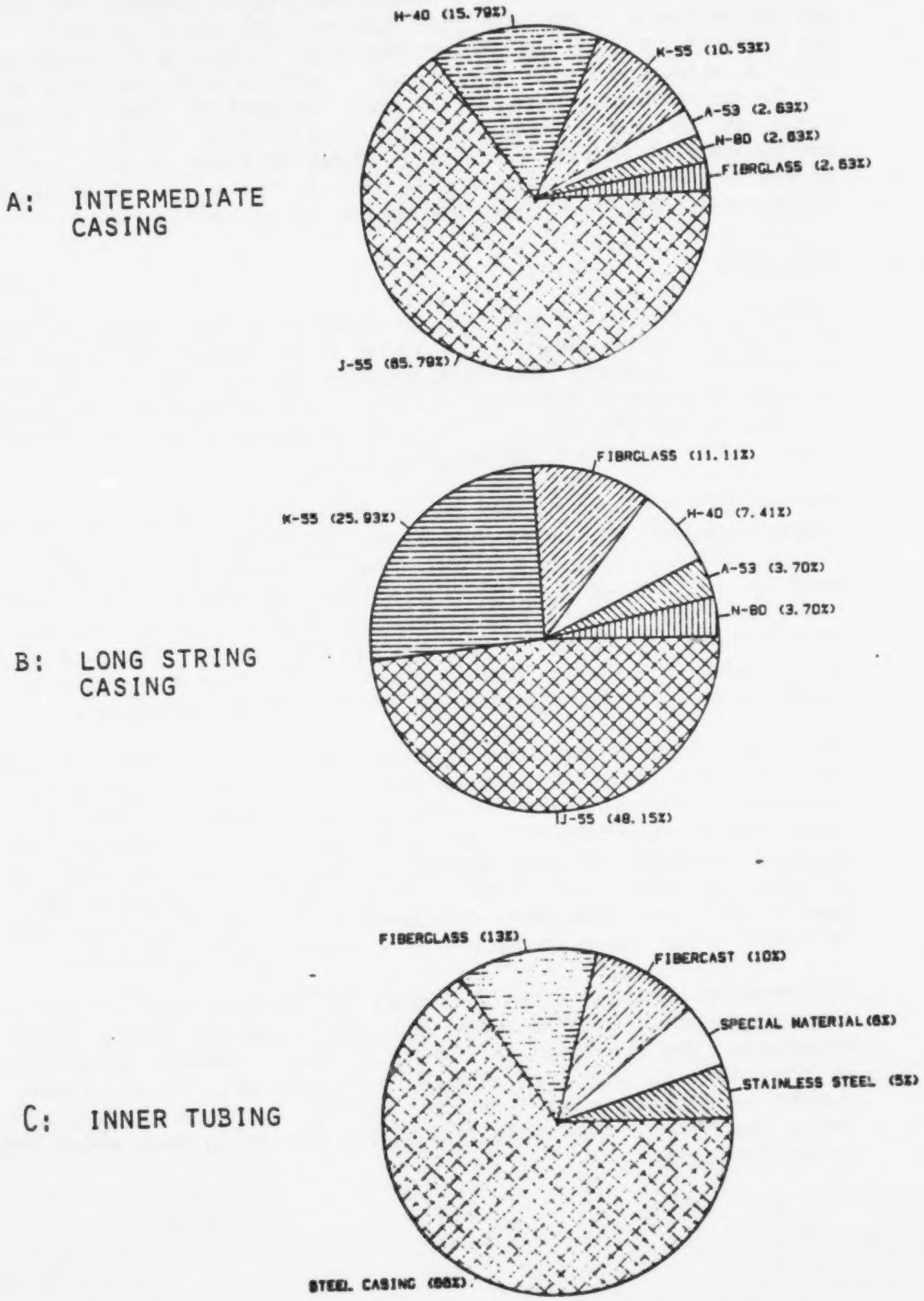
Of all the wells with information on annular fluid, those using brine or fresh water with inhibitors were the most common. Other common fluids used include: oil, kerosene and diesel fuel.

Packer

Packers are used at or near the end of injection tubing to isolate injection fluids and pressure from the annulus between the tubing and casing. They serve to "plug" the annulus between the tubing and the casing. There are several types of packers which can resist pressure either from the top and bottom or only in one direction. Generically, there are only two types of "packers": the mechanical type which actually uses a device to plug the annulus; and fluid seals which depend on hydraulically balancing the annulus fluid column and the usually denser waste fluid column in the tubing, as in a manometer.

FIGURE VI-7

WELL CONSTRUCTION MATERIALS USED



Information on 72% of the wells indicates that ninety-three percent (93%) use some type of mechanical packer. In the visited facilities, most wells use a mechanical packer between the long string casing and the injection tubing. Others use a fluid seal in the tubing/long string annulus. Figure IV-8 shows this type of completion with fluid seal. Packers were reported to be of the compression, tension, or other mechanical types; of various sizes and materials (stainless steel, zirconium, carbon steel); and of several brands and models. Most of these packers are set at the bottom of the long string casing. Some are set at various depths up to 400 feet from the bottom of the tubing.

4.2.3 Cementing

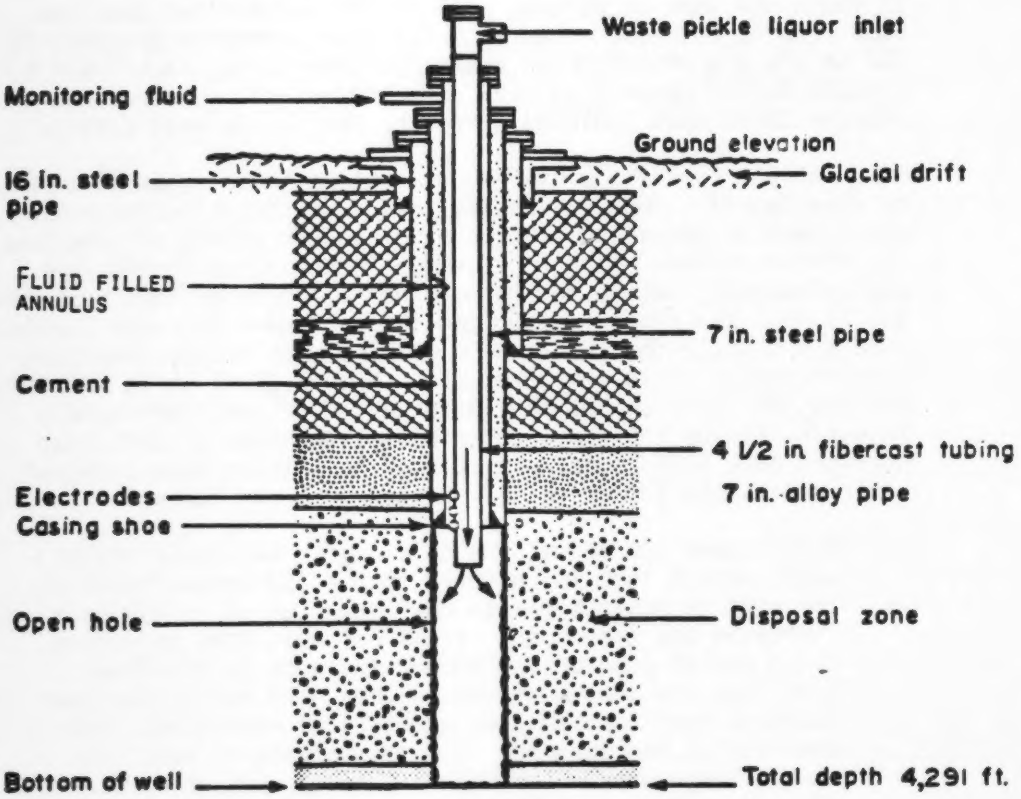
Cement is applied between the outer walls of the casing and the borehole or other casing. The major functions of the cement are to restrict movement of fluids between the surface and the subsurface or between different strata in the subsurface, to support the casing, to prevent pollution of underground sources of drinking water, and to prevent casing corrosion.

The selection of cement and cement additives is based on depth, temperature and pH conditions of the injection or formation fluids. Many different compositions of cement are available to meet the particular specifications that are needed to complete the well. The additives selected are valuable in controlling the rate of setting of the cement, in changing the density and strength of the base cement, in limiting slurry loss to formations, in reducing cost, and in increasing resistance to corrosion.

The most common cement used in well completion is Portland cement. Two important criteria in selecting a cement are compressive strength development and thickening time. These, as well as other necessary properties and characteristics of cements, can be obtained through blending specialty cements or by the addition of specific cement additives. Several specialty cements and cement additives have been developed to achieve certain properties or alter basic characteristics of standard cement classes.

Information obtained from 67 percent of the active wells indicates that 90 percent of these wells have their surface casing fully cemented. The intermediate casing is fully cemented in 98 percent of the cases and the long string in 88 percent. In all cases, cement is applied in at least one string, from the surface to below the base of the USDWs and at the confining zone above the injection zone.

FIGURE IV-8


Waste pickle liquor inlet
Monitoring fluid
Ground elevation
Glacial drift
16 in. steel pipe
FLUID FILLED ANNULUS
7 in. steel pipe
Cement
4 1/2 in fibercast tubing
7 in. alloy pipe
Electrodes
Casing shoe
Open hole
Disposal zone
Bottom of well
Total depth 4,291 ft.

INJECTION WELL WITH OPEN ANNULUS COMPLETION

4.3 Corrosion Control

Corrosion is the transformation of a base-metal material to a more stable component, such as an oxide, by a chemical or electrochemical reaction. Corrosion also refers to other types of degradation such as the dissolution of plastic materials by organic solvents.

In injection wells, corrosion can occur inside the tubing, casing, and well head equipment due to contact with the injection fluids. External corrosion of the casing is caused by the soil or water in which the well is placed. All facilities visited practice some form of corrosion control. The most prevalent practice by far is the use of corrosion resistant materials. Each facility, in addition to protecting with selected materials, also uses an annular fluid that inhibits corrosion inside the well casing.

Seven of the facilities visited neutralize their waste streams to some degree. This is usually to ensure compatibility with the injection formation, but it also has the effect of lowering the corrosiveness. Nine facilities either inject fluids that are relatively neutral, or inject into a formation that neutralizes the fluid. The remaining two facilities** have had some difficulties that are clearly the result of corrosion even though they both used corrosion resistant materials. Kaiser Aluminum in Mulberry, Florida, and BASF in Holland, Michigan, both have very acidic injection fluids that have corroded well casings so much that portions have broken off. While both facilities have repaired their wells, the following illustrates what can happen:

> "Kaiser does not adjust the pH of their extremely acidic waste stream that is injected into a limestone formation. The acid is neutralized in the formation as it causes a cavity in the limestone. It is believed that injection fluid caused some of the supporting rock to dissolve away from the bottom of the casing. The casing has been found to leak (probably as a result of corrosion), and when cement was squeezed into the annulus to stop this leak a large portion of the well casing and packer broke off. The repaired well is now protected below the packer and casing by diesel oil that was injected. There is evidence, however, that corrosion also occurred higher up on the casing. Isolating the casing from the injection fluid has stopped the corrosion process."*

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* From the site report on this facility as revised for clarity.

** Twenty facilities were visted however two of these were subsequently found to be non-hazardous facilities.

Two facilities in Texas, Gibraltar and Monsanto, have samples of their casing material that are exposed continuously to the waste stream at a location that is accessible above ground. These "weight-loss" specimens provide a warning of corrosion at an early stage.

None of the facilities visited practice cathodic protection to decrease the corrosion potential of their injection wells. Even though cathodic protection is not used, corrosion control practices on the whole appear to be sound. However, the common practice at a few of these facilities has been to rework an injection well only after leaks are detected.

4.4 Mechanical Integrity of Injection Wells

4.4.1 Requirements

In developing regulations to prevent pollution of underground sources of drinking water (USDWs) as mandated by Part C of the Safe Drinking Water Act, EPA developed the concept of "pathways of pollution." These pathways refer to the different ways by which underground injection can pollute USDWs. The basic principle is that if one can control these pathways, no pollution would occur. Two of the most important potential causes of USDW pollution are: breaches in the casing, tubing, and packer; and fissures, channels, or insufficient or total absence of cement in the space between the borehole walls and the casing. The mechanism put in place in the Underground Injection Control (UIC) regulations to control these pathways of pollution is known as the mechanical integrity test (MIT) requirement.

The term mechanical integrity is used in injection well technology to indicate that a facility has sound operational components (and by inference does not allow fluids to contaminate or to cause to contaminate underground sources of drinking water). With the advent of the Underground Injection Control program, mechanical integrity requirements for all UIC facilities were further defined. In general, operators of all Class I wells have to show during construction and prior to start of operation and at least every five years thereafter that their wells have mechanical integrity. The mechanical integrity requirement under the UIC program is twofold,and in accordance with the "pathways" mentioned above. The UIC technical regulations under 1) 40 CFR §146.08 (b) define the tests which are acceptable to demonstrate that "there is no significant leak in the casing tubing or packer"; and 2) 40 CFR §146.08 (c) defines acceptable tests to demonstrate that "there is no significant fluid movement into an underground source of drinking water through vertical channels adjacent to the injection well bore."

The first requirement concerns the integrity of all the tubular goods. The second requirement concerns the effect of the drilling of the well through the different strata and especially the naturally occurring "confining" or impermeable zones between aquifers. When the well is drilled, a conduit is created for communication between the different strata, and unless an adequate cementing program is followed, movement of fluids could occur from the injection zone into other formations or between formations penetrated by the well. In both cases, such movement can result in the degradation of an underground source of drinking water by either the injection fluid or formation fluids of lesser quality. Figure IV-9 depicts the injection well with a leak through the casing and fluid movement through a vertical channel.

The acceptable tests which are required before injection begins are shown in Table IV-1. They are divided into two categories: 1) test required before the casing is installed; and 2) test required after the casing is installed and cemented. Additionally, EPA has recommended that all such tests for HW wells be witnessed by the regulatory agency (State or EPA). The acceptable mechanical integrity tests which are required periodically during the life of the well are shown in Table IV-2. They are divided into two categories: 1) tests to prove that there are no leaks in the tubular goods and the packers; and 2) tests to prove that there is no movement of fluids along the borehole.

Table IV-3 shows the applicability of tests that may be used for mechanical integrity verification. Other specific and technical information on the different types of MITs can be found in EPA technical assistance manuals and EPA guidance documents.

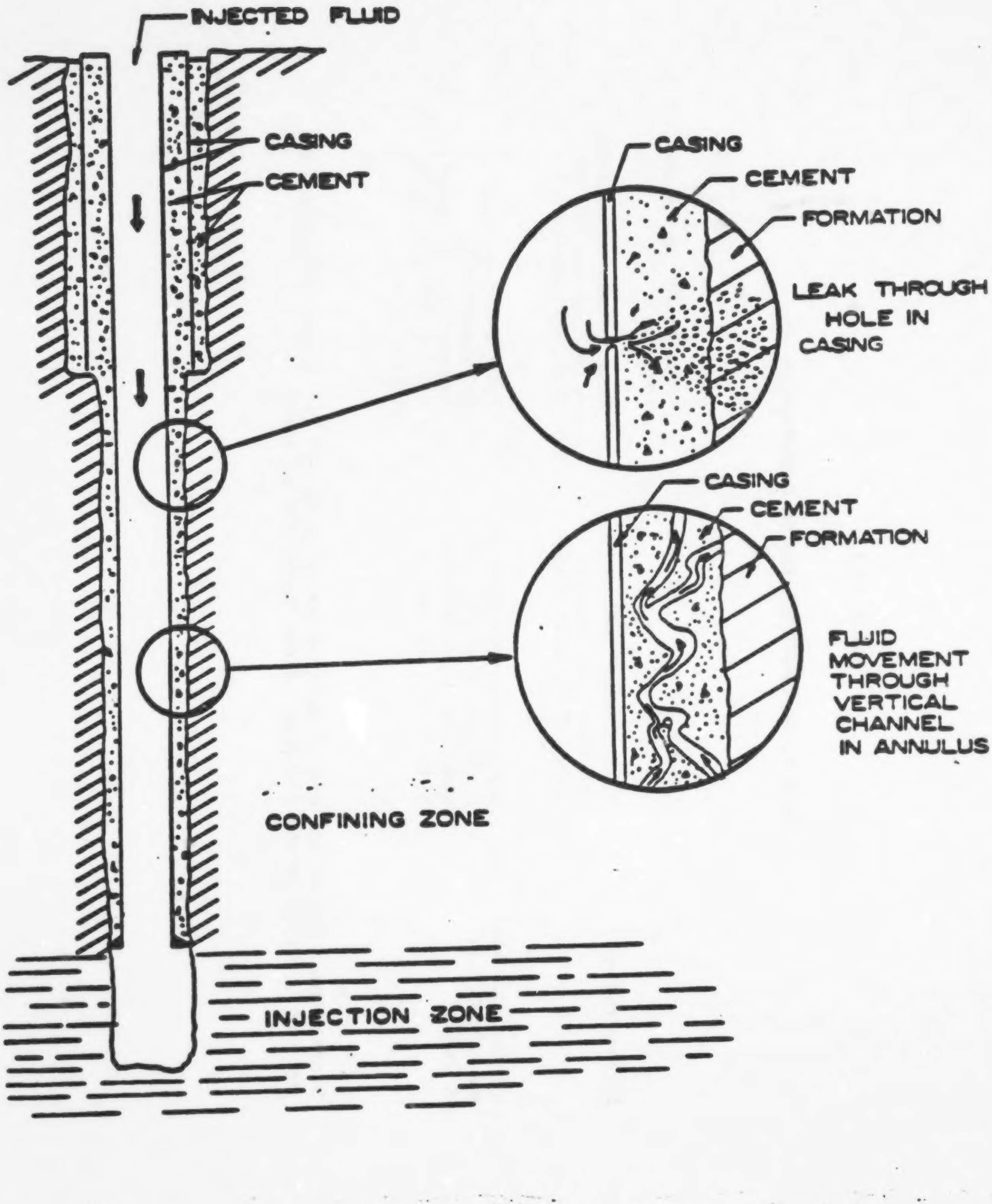
4.4.2 Findings

Information on the tests done at the wells to confirm mechanical integrity was obtained from state files almost exclusively. Several problems developed during the data gathering effort. One problem was that in most cases the files contained only information on the tests done during the construction of the well. Another problem was that since each service company has proprietory names for the test they do, it was difficult to assess which tests were done, and in fact, what they tested for. This latter problem was made more acute since several mechanical integrity tests (logs) have more than one application.

The possible reason for the incomplete information found in the files is that delegation of the UIC program took place recently

87<

FIGURE IV-9


INJECTED FLUID
CASING
CEMENT
CASING
CEMENT
FORMATION
LEAK THROUGH HOLE IN CASING
CASING
CEMENT
FORMATION
FLUID MOVEMENT THROUGH VERTICAL CHANNEL IN ANNULUS
CONFINING ZONE
INJECTION ZONE

Schematic Diagram Showing Lack of Mechanical Integrity

TABLE IV-1

TESTS TO BE CONSIDERED DURING CONSTRUCTION

	Before casing is set	After casing is set and cemented
Surface casing *	Resistivity, spontaneous potential and caliper logs (40 CFR §146.12(d)(2)(i)(a))	Cement bond, temperature, or density log (40 CFR §146.12(d)(2)(i)(b)
Intermediate and and long string of casing*	Resistivity, spontaneous potential, porosity, and gamma ray logs (40 CFR §146.12 (d)(ii)(a))	Fracture finder logs and cement bond, temperature, or density log (40 CFR §146.12(d)(ii)(b) & (c))

*Some of these logs do not test mechanical integrity per se, but obtain information on the ease to inject or the lithology of the formations affected.

TABLE IV-2

ACCEPTABLE TESTS TO PROVE MECHANICAL INTEGRITY PERIODICALLY (**) (***)

To Prove	For Class I HW Wells	In Addition
No significant leaks	Monitoring of Annulus pressure, Pressure tests with liquid or gas [40 CFR §146.08(b)(1) and (2)].	Other tests may be deemed adequate upon review and approval by EPA.
No fluid movement along borehole	Temperature and noise logs [40 CFR §146.08(c)(1].	Other tests may be deemed adequate upon review and approval by EPA.

**Other tests can be used if approved by EPA.

***Representatives of the UIC regulatory agency (States or EPA) have to witness at least 25% of all MITs.

TABLE IV-3

APPLICABILITY OF TESTS THAT MAY BE USED FOR MECHANICAL INTEGRITY VERIFICATION

TEST	CAUSE OF INJECTION WELL FAILURE				APPLICABILITY TO TYPES OF CASING	
	LEAKS IN CASING, TUBING OR PACKER		FLUID MOVEMENT BEHIND CASING		METAL	PVC AND SIMILAR SYNTHETICS
	Presence	Location	Presence	Location		
Pressure Test	yes	no (1)	no	no	yes	yes
Monitor Annulus Pressure	yes	no	no	no	yes	yes
Temperature Log	yes	yes	yes	yes	yes	yes (2)
Noise Log	yes	yes	yes	yes	yes	yes (2)
Radioactive Tracer Log (4)	yes	yes	yes (5)	yes (5)	yes	yes
Cement Bond Log (4)	no (3)	no (3)	yes (3)	yes (3)	yes	yes (2)
Caliper Log (4)	no (3)	no (3)	no (3)	no (3)	yes	yes
Casing Condition Log (4)	yes (3)	yes (3)	no (3)	no (3)	yes	no

(1) can be "yes", if test is staged.
(2) log response may be somewhat dampened - test may not be adequate.
(3) may indicate potential failure site by showing corrosion spots and holes.
(4) may be used with approval of EPA Administrator.
(5) only if access by tracer can be gained through the casing or beneath casing shoe.

in most States. Their underground injection control program prior to delegation may not have had requirements for MIT which paralleled the Federal program. As the states implement the Federally mandated UIC program their MIT program will become more structured.

During the design and construction stage of an injection well, emphasis is placed on the structural integrity and operational soundness of the well. This is because of the large investment in the drilling of deep wells. Therefore, most of these wells have a very thorough testing program to ensure their structural and operational soundness (as discussed above). In many cases, the tests done to assure that the well is properly supported (structural) and that it can be pressurized (operational) will also determine whether the well has mechanical integrity and the USDWs are protected. In all the sites surveyed, a number of MITs were done during construction of the well. The most common are pressure tests, cement bond logs and caliper logs. Other fairly common tests done during construction include temperature, density, neutron logs and radioactive tracer surveys. Table IV-4 gives the breakdown by categories and applicability of the MITs for each site visited. Another consideration which is very important in the determination of the degree of protection of USDWs is the extent and effectiveness of cementing the well casing. In all the sites visited, it was found that some type of a test (cement bond, 3D Velocity, temperature) was run to confirm the soundness of the cementing job. These findings indicate that at least in the facilities visited, cementing practices are adequate to protect USDWs.

Another major test in determining the degree of protection of USDWs is the assurance that there is no potential for the escape of injection fluid through leaks in the casing tubing and packer. This consideration is addressed in all the wells surveyed either at the time of construction or as the result of corrective action. In most cases, the potential for leaks was investigated by doing pressure tests and by running caliper and microcaliper logs and Radioactive Tracer Surveys (RATs). Periodic pressure tests and RATs are most effective in these circumstances, however caliper logs are not recommended unless the breach is significant.

The two States which have started to implement a periodic MIT program have chosen to use the RATs test to determine the presence of channels in the cement. This test is extremely useful to determine any upward movement of injection fluid from the injection zone and to determine leaks in the injection string. The use of RATs to determine the absence of channels in the cement outside the casing is not effective in all cases, however.

TABLE IV-4

MIT Performed in Facilities Visited *

FACILITY	Tests for Leaks	Tests for Channels in the cement
Region IV		
Kaiser, FL	Caliper, microcaliper logs and pressure tests	Temperature log
Stauffer, AL	None for wells 1 & 2 Radioactive Tracer Survey (RATS) for #3	Cement bond temperature log (#3)
Filtrol, MS	Pressure test	Cement bond log
DuPont, KY	Pressure test, caliper log and RATS	Cement bond, variable density logs
Region V		
Allied Chemical, IL	Caliper log, RATS pressure test	Temperature, cement bond density, neutron logs
Cabot, IL	Caliper, EM thickness logs pressure test (tubing)	Temperture, cement bond log
Inland Steel, IN	Down-hole camera, micro-caliper, sonic logs	Cement bond, temperature logs

* Not all the tests done were included, since there was doubt of their purpose (see text). Also, not all the tests are EPA approved mechanical integrity tests.

TABLE IV-4 (cont'd.)

MIT Performed in Facilities Visited *

FACILITY	Tests for Leaks	Tests for Channels in the cement
BASF-Wyandotte, MI	Caliper log	Cement bond log
Chemical Waste, OH	Pressure test, RATS	Cement bond, 3D-Velocity density logs
Sohio, OH	Dia-log, caliper log	Cement bond log
Region VI		
Chemical Resources, OK	Caliper, microcaliper logs and RATS	Cement bond, temperature logs
Gibraltar, TX	Caliper, long and pressure test	Cement bond, temperature logs
Monsanto, TX	Caliper log, RATS, pressure (3D-Velocity) log (all)	Cement bond log (RATS 4), 3D-Velocity log (all)
EMPAK, TX	Caliper log, pressure test	Cement bond log
DuPont, TX	Caliper log, RATS, pressure log and RATS	Cement bond, variable density logs
Rollings, LA	Pressure test, RATS,	None specifically identified, however, text implied some were done
Shell-Norco, LA	Pressure test, RATS, caliper log	Cement bond, variable density logs
Region IX		
Rio Bravo, CA	Pressure test, spinner log and RATS	Temperature log

EPA will define the applicability of the RATS test in the near future through an ongoing research effort.

Three facilities visited have not performed any UIC or UIC related mechanical integrity tests within the last five years according to plant records. Although these facilities are not out of compliance with State permits, they need to upgrade the operation, including periodic MITs, to fulfill the requirements of yet unissued UIC permits. These facilities are Inland Steel Company in East Chicago, Indiana; BASF Wyandotte Corporation in Holland, Michigan; and Sohio Chemical Company in Lima, Ohio. Of the fifteen facilities that have performed mechanical integrity tests, four have tested within the last five years, three test every two years, and two test annually. The remaining six facilities have performed mechanical integrity tests less than one year ago of which the following two are included:

1. Chemical Waste Management (CWM) in Vickery, Ohio, had mechanical integrity tests run on all six of their injection wells late in 1983 by order of the State of Ohio as a result of leakage detected during a recent inspection. All of the six wells were found to be leaking and were shut down. Five of the wells have subsequently been worked over and put back into operation. The fate of the sixth well is yet to be determined. CWM was fined 12.5 million dollars for these and other violations by the Ohio Environmental Protection Agency.

2. Chemical Resources, Inc. (CRI), of Tulsa, Oklahoma, ran mechanical integrity tests on its one injection well early in 1983 and found the casing to have many holes and a deteriorated packer. The well was completely reworked and will have mechanical integrity tests performed on it every six months. There is on-going legal action against CRI by the State.

It is worth noting that at all the sites, which have had problems in the past related to underground injection, the problems were either identified or confirmed by the performance of mechanical integrity tests. The requirement for MITs under the UIC regulations thus appears to be the most effective tool in identifying the potential for pollution of USDWs as a result of underground injection.

Chapter V

Waste Characteristics

5.1 Introduction

Operators of Class I HW wells are required to monitor the characteristics of the injected fluids with sufficient "frequency to yield representative data of their characteristics." (40 CFR §146.13(b)(1)). In most of the cases the State establishes the parameter for which it requires the permittee to test. Not only do the parameters vary from state to state, but so does the degree of detail in the testing. This is reflected in the kind of waste characteristics information which was obtained from state files and the subsequent verification effort. In general the information obtained for the waste characteristics is not specific enough to be amenable to classification by compound, rather it is only adequate to be treated under generic headings (see Section 5.2 below).

Much of the waste is pretreated before being injected. This study indicates that the large majority of HW operations use some type of physical or physical-chemical process to remove suspended solids prior to injection. Many also treat the fluids by adjusting their pH. This is done to avoid precipitation and other undesirable chemical reactions in the injection zone and in the well itself. The process generally guarantees that the injected fluids will be compatible with formation fluids and with each other. Waste streams may also be blended prior to injection. The most common treatments were found to include sedimentation, disinfection, filtration, oil and grease removal, neutralization and dilution.

5.2 Waste Classification

For the reasons indicated above, wastes have been classified as acids, heavy metals, organics, hazardous inorganics, non-hazardous inorganics and "other". Acids are either inorganic or organic liquids with a pH either equal to or less than 2.0. Heavy metals include waste streams which have concentrations of arsenic, barium, cadmium, chromium, lead, mercury or nickel. Organics consist of those componds which contain carbon. Hazardous inorganics include selenium and cyanide. In addition to the hazardous components, many non-hazardous inorganics are injected with the waste stream. The non-hazardous inorganics category generally includes those inorganic compounds not classified in the above categories. There was a small amount of overlap between the organic and the acid categories. The "other" category includes fluid wastes reported and identified by their chemical oxygen demand (COD), biochemical oxygen demand (BOD) and total suspended solids (TSS). Because of the lack of specific information these were assumed to be hazardous.

5.3 Distribution of Waste Types

Data was compiled on the waste characteristics of 108 hazardous waste injection wells. With this information on over half of the HW wells currently in operation, the total volume of undiluted hazardous waste for all 181 HW injection wells active in 1983 was extrapolated.

Utilizing their annual flow volumes and waste concentration, it was found that during 1983 the 108 wells disposed a total of 228,021,900 gallons of non-aqueous* waste with 6.2 billion gallons of water. Forty-eight percent (109,342,200 gallons) of this non-aqueous waste was hazardous, while the remaining 52% (118,679,700 gallons) was nonhazardous inorganics**. Of the non-aqueous hazardous waste, acids account for 41.27% by volume, organics for 36.27%, heavy metals for 1.39%, hazardous inorganics for .08%, and "other" for 20.99%. This data is listed in Table V-1 and graphically depicted in Figures V-1 and V-2.

To extrapolate the volume of non-aqueous hazardous waste injected down all 181 HW wells active in 1983, the total volume of 11.5 billion gallons injected in 1983 (estimated in Table II-2) is utilized. Then a ratio is set up between the total estimated volume injected down the 108 wells in 1983 and the volume of actual non-aqueous waste injected down. This ratio is compared to the total volume of 11.5 billion gallons injected in all the 181 wells, and the volume of non-aqueous waste disposed in the 181 wells is calculated from there.

It was found that an estimated 423,000,000 gallons of non-aqueous waste was deposited down the 181 HW wells. Utilizing the percentages of waste components found in the 108 wells, it can be estimated that 220,000,000 gallons (52%) of the non-aqueous waste was nonhazardous and that 203,000,000 (48%) was hazardous. The non-aqueous hazardous waste can be further broken down: 83,800,000 gallons were acids; 2,800,000 were heavy metals; 73,600,000 were organics; 200,000 hazardous inorganics; and 42,600,000 "other".

5.4 Concentration of Waste Stream Components

Table V-2 lists the individual waste components classified

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* This is the waste stream devoid of water

** It should be emphasized that under RCRA regulations the whole volume injected is considered hazardous waste.

TABLE V-1

WASTE CHARACTERISTICS OF 108 HW WELLS ACTIVE IN 1983 IN THE UNITED STATES

Waste Type	Gallons	Percent of Total Gallons	Pounds	Well Count
Acids	44,140,900	20.26	367,250,000	35
Heavy Metals	1,517,600	.70	12,626,100	19
Organics	39,674,500	17.40	330,090,000	71
Hazardous Inorganics	89,600	.04	745,800	4
Non-Hazardous Inorganics	118,679,700	52.04	987,410,000	50
Other	22,964,600	9.91	191,070,000	33
TOTAL (non-aqueous)	228,066,900	100.35		
ACTUAL TOTAL (minus overlaps e.g. "organic acids")	228,021,900	100.00		

FIGURE V-1

BREAKDOWN OF THE NON-AQUEOUS WASTE
HAZARDOUS AND NON-HAZARDOUS

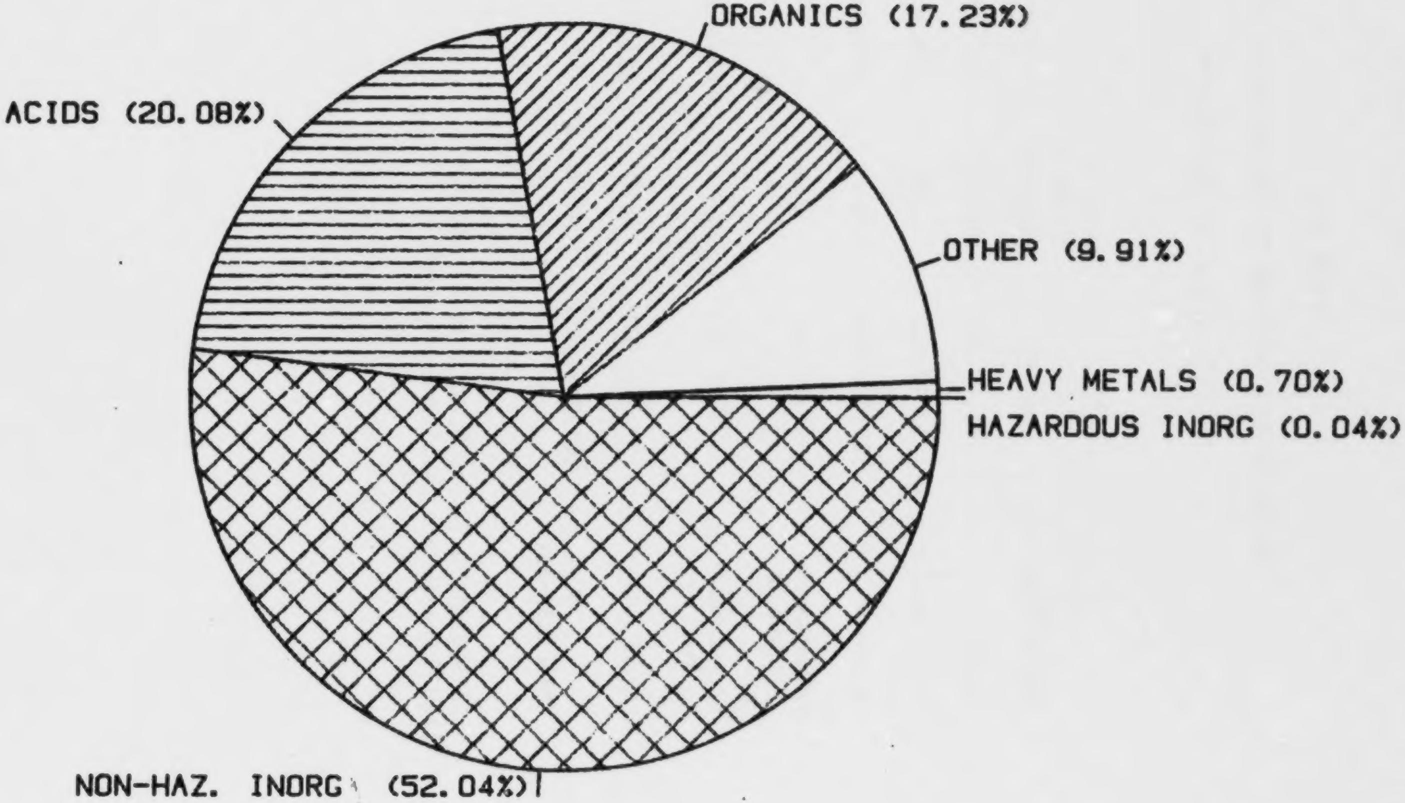

FIGURE V-2

BREAKDOWN OF THE NON-AQUEOUS HAZ. WASTE

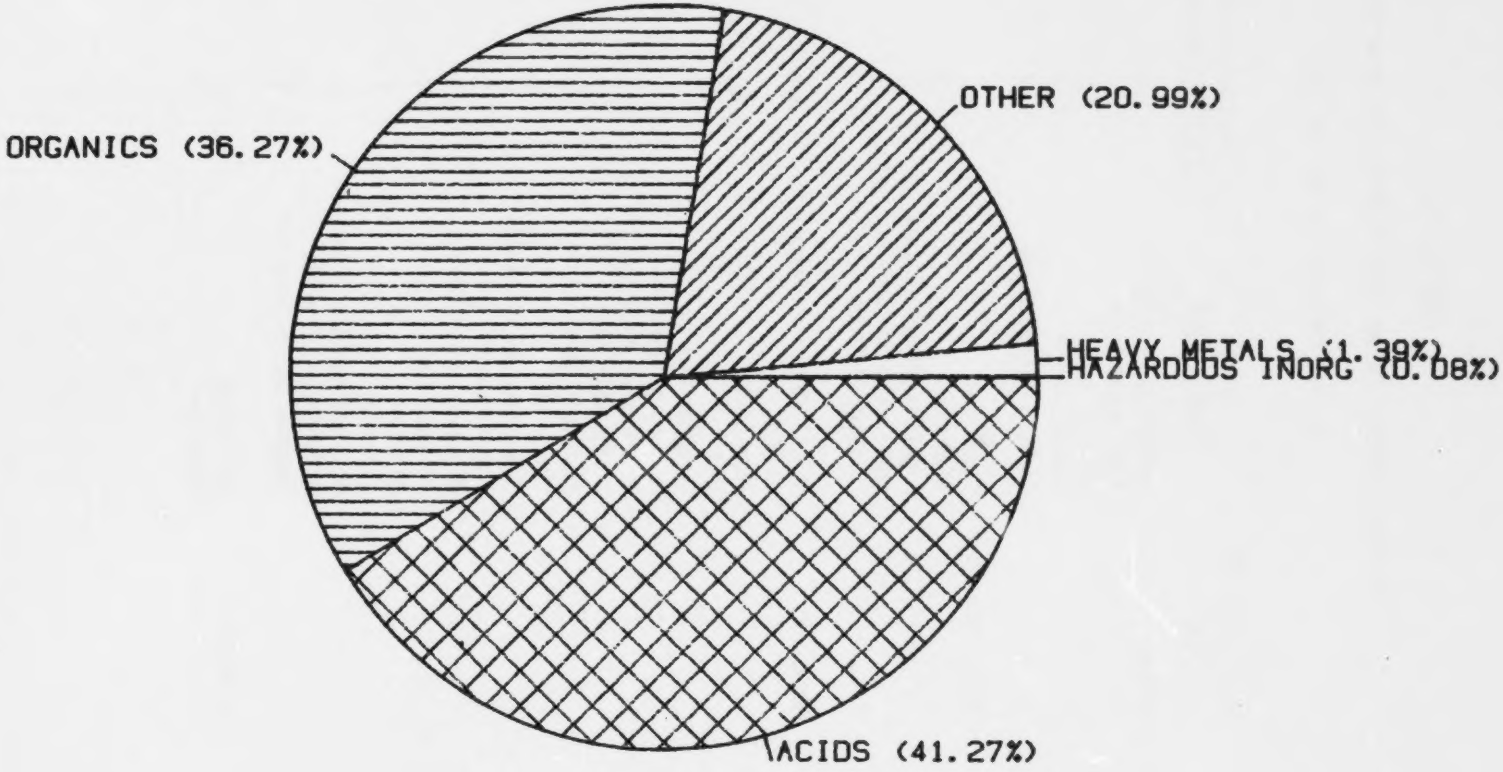

TABLE V-2

HW WELL WASTE STREAM COMPONENTS AND CONCENTRATION IN THE UNITED STATES IN 1983

Waste Stream Type	Waste Components	Incidence of Injection by wells	Average Concentration (mg/l)
Acids	Hydrochloric Acid	15	78,573
	Sulfuric Acid	6	43,000
	Nitric Acid	2	75,000
	Formic Acid	2	75,000
	Acid, unspecified	12	44,900
Heavy Metals	Chromium	11	1.4
	Nickel	5	600
	Metals, unspecified	2	5,500
	Metal Hydroxides unspecified	1	1,000
Organics	Total Organic Carbon (TOC)	24	11,413
	Phenol	22	805
	Oil	6	3,062
	Organic Acids	3	10,000
	Organic Cyanide	3	400
	Isopropyl Alcohol	3	1,775
	Formaldehyde	2	15,000
	Acetophenone	2	650
	Urea "N"	2	1,250
	Chlorinated Organics	2	35,000
	Formic Acid	2	75,000
	Organic Peroxides	2	4,950
	Pentachlorophenol	2	7.6
	Acetone	2	650
	Nitrile	1	700
	Methacrylonitrile	1	22
	Ethylene Chloride	1	264
	Carbon Tetrachloride	1	970
Hazardous Inorganics	Selenium	2	.3
	Cyanide	2	391

as either acids, heavy metals,organics,or hazardous inorganics. Hydrochloric acid was the most frequently injected acid, while chromium was the most common heavy metal, and phenol the most common organic. Acids were,by far, the most concentrated components of the waste streams. The average hydrochloric acid concentration was 78,573 mg/l., followed by nitric and formic acid at 75,000 mg/l., and sulfuric acid at 43,000 mg/l.

5.5 Distribution by Waste Codes

With the inception of the Resource Conservation and Recovery Act (RCRA), a system of codes was introduced corresponding to the various types of hazardous waste. The hazardous waste codes are used to identify individual compounds, hazardous characteristics and specific process wastes.

Hazardous waste codes were obtained for wastes injected in 84 wells active in 1983 contained within 47 facilities. In general, assessment of distribution by waste codes was limited by the fact that complete information identification of RCRA codes and amounts injected was available on only 51 of the wells. The most frequently reported hazardous waste codes are listed in Table V-3. In the first column, where quantitative information on the injection volumes was absent, the applicability of the codes is ambiguous. The codes either refer to the wastes generated or to wastes injected but of unknown volume. The wells listed in the second column are those which are known to have definitely injected wastes identified by RCRA codes. Based upon incidence of reported hazardous waste codes alone, corrosive waste (D002) was the most commonly encountered RCRA waste. The next most prevalent type of wastes were ignitable wastes (D001), followed by reactive wastes (D003) and spent pickle liquor (K062) from steel finishing operations.

5.6 Section 201(f) of the Hazardous and Solid Waste Amendments

The Hazardous and Solid Waste Amendments of 1984 are specifically concerned with the disposal of dioxins and solvents (RCRA codes F020-F023 and F001-F005). Forty-five months after the date of enactment of this Amendment the disposal of these wastes "is prohibited unless the Administrator determines the prohibition of one or more methods of land disposal of such waste is not required in order to protect human health and the environment for as long as the wastes remain hazardous." Of the wells which reported RCRA codes (only 84 of the 181 wells active in 1983), none reported disposing dioxins.

Eight wells reported the solvents with RCRA codes F001, F002, F003, F004, F005. More specifically F001 and F002 are spent halogenated solvents and F003, F004, and F005 are spent

Organics, unspecified 14 13,107

TABLE V-3

ELEVEN MOST FREQUENTLY REPORTED HAZARDOUS WASTE CODES IN RCRA INVENTORY OF HW WELLS ACTIVE IN THE UNITED STATES IN 1983

Hazardous Waste Disposal Code	Waste Identity	Incidence of Being Reported by Wells	Incidence of Injection By Wells
D002	Corrosive	53	29
D001	Ignitable	28	10
D003	Reactive	20	7
D007	Chromium containing	13	4
K062	Spent pickle liquor from steel finishing operations	12	9
K011	Bottom Stream from wastewater stripper in production of acrylonitrile	8	5
KO13	Bottom stream from the acetonitrile column in the production of acrylonitrile	8	5
K014	Bottoms from acetonitrile purification column in production acrylonitrile	7	5
F001	Halogenated solvents used in degreasing	7	4
U105	Benzene	5	0

non-halogenated solvents. In four of these wells it was ambiguous as to whether these wastes were actually injected. The particular facilities injecting these solvents are listed in Table V-4.

The Hazardous and Solid Waste Amendments are also concerned in Section 201(f) with the disposal of particular liquid hazardous wastes. The Amendments require that not later than 45 months after the date of the enactment of these Amendments "the Administrator shall complete a review of the disposal of all hazardous wastes referred to in paragraph (2) of subsection (e) by underground injection into deep wells". Of the wastes listed in the "California list", only wastes with a pH $\leq$ 2.0 and with nickel in concentrations higher than 134 mg/l were found to be injected.

Of the 181 active wells in 1983, information concerning the pH of the waste streams was obtained on 138 wells. There were 133 wells which reported a pH greater than 2 and 35 wells (25% of the total) had a pH less than or equal to 2. The wells injecting acids with a pH $\leq$ 2 are listed in Table V-5. Nickel with a concentration of $\overline{500}$ mg/l was found to be injected into wells by E.I. Dupont (Victoria, Texas).

5.7 Section 201(g) of the HSWA

Section 201(g) of the HSWA might also affect the injection of hazardous waste. In the case of any hazardous waste identified or listed under §6921 of the Solid Waste Disposal Act the Administrator shall promulgate final regulations prohibiting one or more methods of land disposal of the wastes listed except for methods of land disposal which the Administrator determines will be protective of human health and the environment for as long as the waste remains hazardous. These listed wastes are ranked taking into consideration their intrinsic hazard and their volume. For the first one-third of the listed wastes the Administrator shall promulgate regulations or make a determination of their protectiveness within forty-five motnhs after November 8, 1984. For the second third, the deadline is fifty-five months, and for the last third, the deadline is sixty-six months.

5.8 Off-Site Operations

Off-site operations may be characterized as commercial waste disposal facilities which accept a variety of wastes from various manufacturing and industrial concerns located off the site of the injection well. Due to the high variability in composition of waste streams disposed of in these wells (up to 300 different waste streams were reportedly accepted at a single off-site facility), very little can be generalized about the

TABLE V-4

FACILITIES INJECTING RCRA CODES F001, F002, F003, F004, and F005

State	Facility	Well No.	F001	F002	F003	F004	F005
Alaska	Arco Alaska Inc.	1	x	x	x		x
Louisiana	Witco Chemical Corp.,Gretna	1					x
Ohio	Chemical Waste Management, Inc.	3	*				
		4	*				
		5	*				
		6	*				
Oklahoma	American Airlines	1	x				
	Chemical Resources, Inc.	1	x		x	x	x

x Reported RCRA codes ambiguous as to whether this waste was injected

* Reported injected RCRA codes

TABLE V-5

WELLS INJECTING ACIDS WITH pH LESS THAN OR EQUAL TO 2 IN THE UNITED STATES IN 1983

STATE	FACILITY	WELL NUMBER	pH
FL	Kaiser Aluminum & Chemical Co.	1	<1.0
	Monsanto Co.	1	1.5-4.0
		2	1.5-4.0
		3	1.5-4.0
IL	Allied Chemical Co.	1	1.0
	LTV Steel Co.	1	< 1.0
IN	Midwest Steel	1	1.0
	United States Steel Corp.	IN9	< 1.0
KS	Vulcan Materials Co.	4	1.0-12.5
		7	1.5-13.0
		8	1.0-12.5
		9	1.0-12.5
KY	E.I. Dupont De Nemours & Co.	1	2.0
		2	2.0
LA	BASF Wyandotte Chemical Corp.	D-1	< 1.0
	Intrn'l. Minerals & Chemical Corp.	1	1.0
		2	1.0
	Shell Oil Co., West Site	8	0.2
		9	0.2
MI	BASF Wyandotte	2	2.0 (ave.)
		3	2.0 (ave.)
MS	Filtrol Corp.	1	1.8 (ave.)
OH	Chemical Waste Management, Inc.	5	0.5
		3	0.5
		4	0.5
		6	0.3
TX	EW.I. DuPont, Sabine River Works	10	1.1
		8	1.1
		ADN3	1.5
	E.I. DuPont, Victoria	10	0.2 (ave.)
		7	0.2 (ave.)
		6	0.2 (ave.)
		5	2.0
	Potash Co. of America Division	1	1.0

types of wastes disposed at off-site Class I well facilities. Table V-6 provides the number, location and estimated annual volume injected by the active offsite wells. The 13 wells active in 1983 constitute 8.3% of the total number of active Class I wells and account for about 4.1% of the calculated total annual volume injected by active Class I wells.* It appears, then, that off-site wells do not receive a disproportionate volume of hazardous waste. Dividing the total annual volume for off-site wells 475 by the number of wells gives an approximate average injection volume of 31.7 million gallons of waste per well per year. The average injection volume for all active Class I wells is 63 MGY.

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* Three more off-site wells started or returned to operation in 1984. It is estimated that in 1984 the percentage of volume injected in off-site wells was 4.4%.

TABLE V-6

VOLUME INJECTED INTO ACTIVE CLASS I HW OFF-SITE WELLS IN 1983

State	Number of Wells	Annual Volume Injected (MGY) in 1983
Louisiana	2	90
Ohio	5	101
Oklahoma	1	18
Texas	7	256
TOTAL	15	475

Chapter VI

Regulatory Controls

6.1 Introduction

Three EPA programs regulate the injection of hazardous waste. The RCRA program has jurisdiction over all surface facilities at injection sites and over the disposal of hazardous waste. The NPDES program has jurisdiction over all discharges into waters of the United States, and in some States NPDES permits have been issued for injection wells. EPA lacks federal NPDES jurisdiction over the disposal of wastes through wells; however, States must have specific authority to control this type of disposal in order to receive NPDES program approval (CWA §402(b)(1)(D)). This was resolved by the courts (Exxon vs. Train (10ERC 1289)) in 1977. The UIC program regulates all underground injection facilities. UIC jurisdiction occurs once the liquid enters the injection well.

6.2 Hazardous Waste Management Program

The Resource Conservation and Recovery Act (RCRA) of 1976, as amended, required EPA to develop and implement a regulatory program to control "from the cradle to the grave" those wastes which were determined to be "hazardous" as a result of their "toxicity, persistence, and degradability in nature, potential for accumulation in tissue, and other related factors such as flammability, corrosiveness, and other hazardous characteristics." In fulfilling this statutory mandate, EPA promulgated a set of regulations identifying hazardous wastes and establishing minimum requirements for the generation, transportation, treatment, storage and disposal of hazardous waste. "The Hazardous and Solid Waste Amendments of 1984" became effective November 8, 1984, and set future limitations upon the land disposal of hazardous wastes.

EPA is fully responsible, under RCRA, for implementing this regulatory program throughout the country, including responsibility for issuance of permits to all hazardous waste treatment, storage and disposal facilities. This implementation responsibility may, however, be transferred to any State which has a hazardous waste management program which is "equivalent" (i.e., at least as stringent) to the Federal RCRA, Subtitle C, program. As of February 1984, 44 states had become "authorized" to implement RCRA Subtitle C in lieu of EPA.

Since the RCRA Subtitle C program addressed all hazardous waste generation and management, those injection wells used for disposal of hazardous waste became subject to RCRA regulation in addition to requirements and regulations under the Safe Drinking Water Act (which mandates the UIC program).

By July 26, 1982, EPA had issued the bulk of the RCRA regulations for permitting facilities which treated, stored, or disposed of hazardous waste, both new and existing, except for injection well disposal. However, the Agency determined that under 40 CFR

§270.60(b) hazardous waste injection wells would be granted RCRA "permits by rule." Permits would be granted under an EPA approved UIC program, and it was not necessary to promulgate separate permitting regulations under RCRA. Under these guidelines, all Class I HW wells in hazardous waste management facilities are deemed to have a permit by-rule under the RCRA program if they are permitted under the UIC program. Existing Class I HW wells are authorized by rule in the UIC program until they are formally repermitted following the requirements of 40 CFR Parts 144, 146 and 147 (UIC regulations).

Table VI-1 and figure VI-1 show the numbers of permit or interim status (RCRA) given under each program. The heading "others" gives the number of permits issued by the States independently and not necessarily following Federal standards.

Any other hazardous waste treatment, storage, or disposal unit located at the site of a hazardous waste injection well is subject to full permitting under RCRA and must have a separate permit.

6.3 National Pollutant Discharge Elimination System (NPDES)

The principal mechanism for the control and management of pollutant discharges to waters of the United States is the National Pollutant Discharge Elimination System (NPDES) authorized under Section 402 of the Clean Water Act (CWA) (33 U.S.C. 466 et. seq.). Each discharge permit issued by EPA or an approved state under the NPDES program imposes enforceable pollution control requirements, including:

- Discharge limitations based on national technology-based requirements or, where necessary, more stringent state water quality standards;
- Schedules for needed construction or installation of new pollution control technology; and
- Self-monitoring and reporting requirements.

6.3.1 Limitations of the NPDES Program

Section 402(b)(1)(D) of the CWA specifically requires that States must have sufficient statutory authority to control the disposal of pollutants into wells to qualify for NPDES program approval. Additionally, 40 CFR §123.28 provides that a state with a UIC program approved under Section 1422 of the SDWA satisfies this requirement.

The question of whether or not EPA has the same jurisdiction over disposal of pollutants into wells as States has been addressed in Exxon v. Train (10 ERC 1289). The Court has interpreted the legislative history of the CWA as not authorizing Federal control over any phase of ground-water pollution. Rather, the Court relied heavily on the research provisions of sections 102, 104 and 106 of the CWA to confirm Congressional intent for EPA to

TABLE VI-1

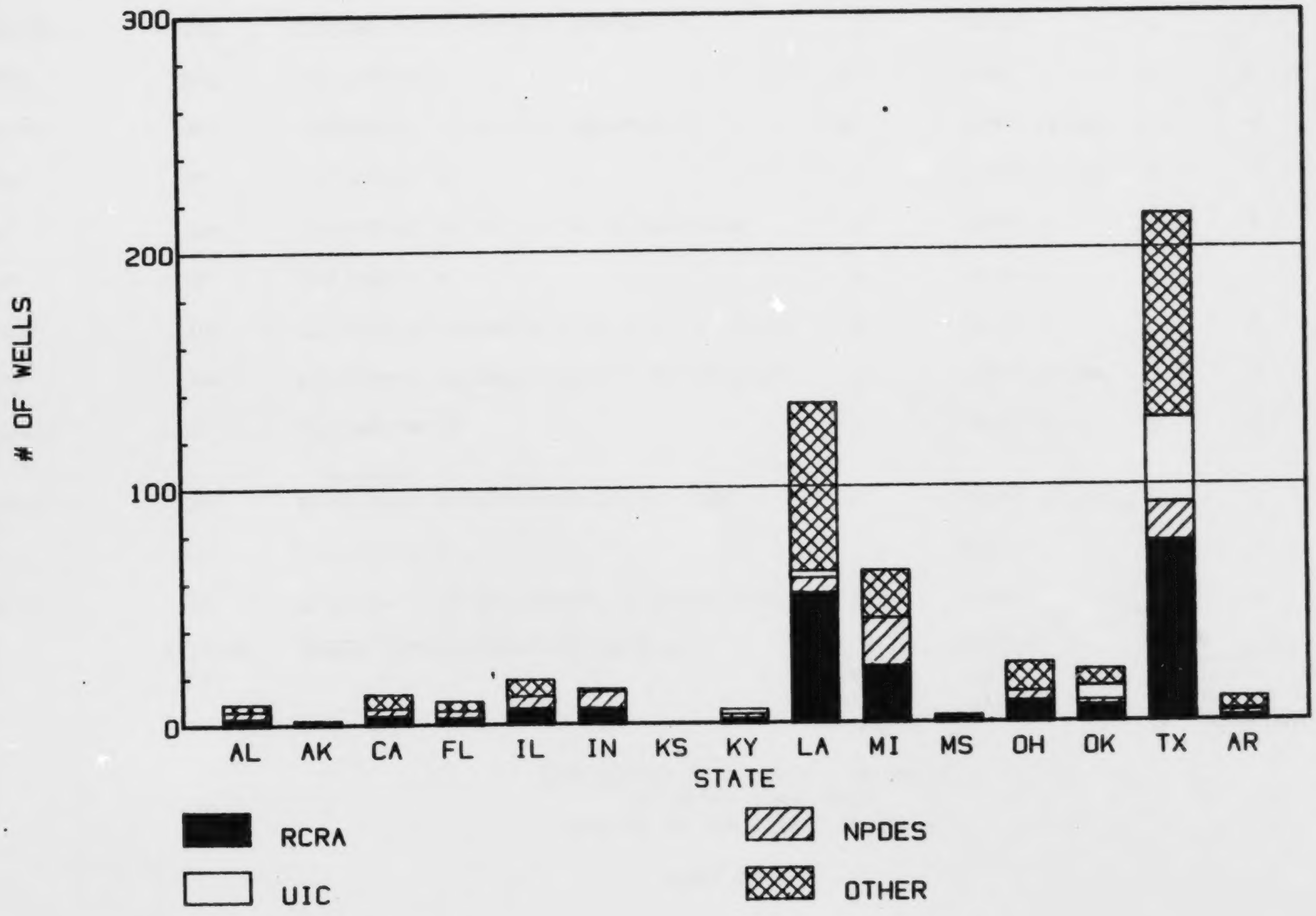
SUMMARY OF PERMITTING PROGRAMS
For Class I HW Wells
(For States with Class I HW Wells)

State	UIC Primacy	Agency Implementing UIC Program	No. of Active Class I HW Wells	RCRA Interim Status	No. of Permits or Interim Status for Class I HW Wells		
					RCRA	NPDES	UI
Alabama	Yes	Department of Environmental Management	2	None	3	3	0
Alaska	No	EPA Region X	1	None	0	0	0
Arkansas	Yes	Department of Pollution Control and Ecology	4	Phase II/ABC**	2	1	1
California	No	EPA Region IX	2	Phase II/A	4	3	0
Florida	Yes	Department of Environmental Regulations	4	Phase II/ABC	3	3	0
Illinois	Yes	Illinois Environmental Protection Agency	6	Phase I	7	5	0
Indiana	No	EPA Region V	8	Phase I	7	7	0
Kansas	Yes	Department of Health and Environment	5	Phase I	0	0	0
Kentucky	No	EPA Region IV	2	Phase II/ABC	2	2	2
Louisiana	Yes	Department of Natural Resources	60	Phase II/ABC	55	6	3
Michigan	No*	EPA Region V	11	None	24	20	0
Mississippi	Yes	Department of Natural Resources	1	Final	1	1	0
Ohio	Yes	Ohio Environmental Protection Agency	14	Phase I	9	4	0
Oklahoma	Yes	Department of Health	6	Phase II/ABC	7	2	6
Texas	Yes	Department of Water Resources	69	Final	76	16	36

* Subject to change
** Letters (i.e. ABC) indicate to what degree delegation of RCRA has occured.

FIGURE VI-1

CLASS I HW WELL PERMITS ISSUED



perform an information gathering role. Efforts to control groundwater pollution should be left to the States until such time as EPA develops the necessary information so that Congress could legislate intelligently on the subject. Thus, the Court held that "... the Administrator, as an incident to his power under §402(a) to issue permits authorizing the discharge of pollutants into surface waters, does not have the authority to place conditions in such permits that control the disposal of wastes into deep wells."

The NPDES permits are also limited with respect to which discharged pollutants fall under their jurisdiction. The term pollutant, as defined in section 502(2) and subsection (B) of the CWA specifically excludes " . . . water, gas or other material which is injected into a well to facilitate production and which is disposed in a well, if the well used either to facilitate production or for disposal purposes is approved by authority of the state in which the well is located, and if such state determines that such injection or disposal will not result in the degradation of ground or subsurface water resources." With this provision, Congress has limited the control of the NPDES program has over oil and gas production.

6.3.2 NPDES Permits

As noted previously, EPA lacks authority to regulated injection wells under the NPDES Program. This authority has been given to the UIC program by Congress. However, NPDES permits do contain monitoring and reporting requirements applicable to injection wells. Generally, monitoring requirements are limited to volume and pressure and, in some cases, pH. Failure to perform monitoring and/or report the results is a violation of the permit and may subject the permittee to permit modification or revocation and administrative or judicial enforcement actions.

To date EPA and the 37 approved NPDES States have issued over 65,000 discharge permits. Of this total, over 7,500 have been classified as major dischargers due to their large size, location with respect to water quality problems, complexity or toxic nature of their discharge. A small number of these issued permits cover the discharge of pollutants into wells. Table VI-1 lists by State the number of Class I HW NPDES well permits issued. Approximately 40% of the wells have been permitted by the NPDES program.

6.4 The Underground Injection Control (UIC) Program

This program was mandated in part C of the Safe Drinking Water Act (SDWA) of 1974. The UIC program is referenced in the SDWA under the title of "The Underground Water Source Protection Program." The SDWA requires EPA to:

- Publish minimum national requirements for effective State Underground Injection Control programs;
- List States that need UIC programs (all States have been listed);

- Make grants to States for developing and implementing UIC programs;
- Review proposed State programs and either approve or disapprove them;
- Give primary enforcement responsibility to States with approved proposals;
- Overview implementation of the program in the States with approved programs;
- Promulgate and enforce UIC programs in listed States which choose not to participate or do not develop and operate an approvable program.

The main purpose of the program is to protect underground sources of drinking water (USDW), defined as aquifers yielding water containing less than 10,000 mg/l of TDS, from any threats resulting from underground injection.

Under the scheme of the SDWA, the national regulations, which were promulgated in 1980, define minimum standards for effective State programs. Requirements become applicable to owners and operators of injection wells in a particular jurisdiction when the Administrator approves a State's UIC program or promulgates a Federally-implemented program for a State, except that injectors of hazardous waste are subject to the interim standards under RCRA. The first State UIC program for Class I wells was approved for Texas in January 1982. By December 1985, UIC programs had been approved or promulgated for all States and Territories.

Existing Class I wells must be repermitted within five years of the effective date of the State or Federal program. New wells may not be constructed without a permit. Existing wells are authorized by rule until they are repermitted. However, within one year from the effective date they must be in compliance with most of the construction, operating, monitoring and reporting requirements of the regulations. Since many States regulated Class I wells in some form prior to the UIC program, the rule requirement in the case of primacy States normally means the continued application of the previously-issued State permit.

While the national regulations allowed five years for the repermitting of the existing Class I wells, EPA hopes to accomplished this much sooner, especially in the case of wells injecting hazardous waste. At the time State programs were approved, the State submissions were required to contain a schedule for calling in Class I permit applications. Furthermore, as part of the Agency's Strategic Planning and Management System, the repermitting of Class I wells has been established as an Agency priority.

6.4.1 Requirements for Class I Hazardous Waste Wells

Because of the potential danger of hazardous wastes, Class I hazardous waste (HW) injection wells must meet very strict construction and operating requirements. These technical requirements are set forth in 40 CFR Part 146, Subparts A and B. Subpart A contains general specifications used for permitting and repermitting all Class I wells. Subpart B provides for specific construction, operation, monitoring, and reporting requirements that take into account the site characteristics for a well. These characteristics include the geology, hydrology, types of waste, and construction techniques. These requirements are discussed further in the section on UIC Permits.

A stated purpose in the Safe Drinking Water Act is the delegation of the UIC program to the States. EPA has delegated the UIC program to States that have most of the HW injection wells, and provides technical and financial assistance to these States for a sound start of the implementation of the programs.

Of the 252 HW injection wells, the 32 delegated States account for 200 wells (80.6%). Of the 195 active wells these States account for 171 (87.7%).

In the event that a State fails to submit an application, or if a State application is disapproved, EPA must promulgate the UIC program for that State and assume primary enforcement responsibility. EPA promulgated direct implementation programs for the 25 States shown in Table VI-2 on May 11 and November 15, 1984. Four of the States (California, Indiana, Kentucky and Michigan) in Table VI-2 are known to have active HW injection wells. A total of 24 active wells in 17 facilities have been inventoried in these States.

TABLE VI-2
EPA Implemented Programs

ALASKA
AMERICAN SAMOA
ARIZONA
CALIFORNIA
COLORADO
*COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS
DISTRICT OF COLUMBIA
*HAWAII
*IDAHO
VIRGIN ISLANDS

INDIANA
IOWA
KENTUCKY
MICHIGAN
*SOUTH DAKOTA
**OSAGE

MINNESOTA
*MISSOURI
MONTANA
NEVADA
NEW YORK
VIRGINIA
PENNSYLVANIA
PUERTO RICO
TENNESSEE
TRUST TERRITORIES

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* These 5 states are also applying for delegation of the UIC program and their status may change.

** Indian Nation, not a State.

6.5 UIC Permits

A permit is a specific authorization to an individual to carry out an activity under certain conditions and limitations. Permits are generally considered to make possible a higher degree of control over the affected activity. On the other hand, permits are resource and time intensive since they require: (1) the individual to file an application containing information about his proposed activity; (2) the effective participation of the public in the review process; and (3) State or EPA personnel to review, write and process each permit.

UIC Class I HW permits may be issued or reissued for a ten year term. In addition, if a facility holds permits under more than one EPA-administered program, all permits must be reviewed whenever any permit is changed, revoked or reissued.

Each permit must be enforceable in the jurisdiction in which it is issued. It must specify construction, abandonment, operating, monitoring and reporting requirements. In addition, permits must incorporate appropriate compliance schedules if any corrective action is to be taken by the well owner/operator. Finally, permits must recognize the right of the permitting authority to have access to the well and related records to assure compliance with permit terms.

The information that must be available to the permitting authority is specified in the State program which is based on the requirements in 40 CFR Part 146. Generally, such information includes the surface and subterranean features of the injection area, the location of underground sources of drinking water in the vicinity, the results of tests in the proposed injection formation, construction features of the well, composition of the injection fluid, and the nature of the proposed injection operation.

The review of a permit application begins with the receipt of a complete application by the permitting authority. The permitting authority considers the application, gathers additional information it needs, and prepares a draft permit. The draft permit must be presented for public comment for at least 30 days with a fact sheet that provides enough information so that the public can make informed judgments about the proposed action. If the Director of the UIC program determines that there is sufficient interest, a public hearing is held and announced at least 30 days in advance before the final permit can be prepared.

Where EPA is the permitting authority, certain other requirements including an administrative record, opportunity for further public hearing and cross examination, revised draft permit and appeal, etc., must be met.

As of January 1985, 48 wells in 26 facilities had been permitted following criteria set in the UIC regulations. These 48 permits account for 24.6% of the total number to be issued. The remainder of the permits have been presented to the regulatory Agencies and are being reviewed. Figure VI-2 shows this fact graphically.

6.5.1 UIC Operational Requirements

The ground-water environment is extremely vulnerable to pollution, and it is extremely slow to cleanse itself when pollution occurs. Due to the vulnerability of ground water and the nation's dependence on this resource, the Underground Injection Control program must have strong operational and monitoring requirements. Operational requirements for Class I wells under the UIC program include (40 CFR §146.13(a)):

1) Injection pressure must not exceed a pressure which would initiate or propagate fractures in the injection or confining zones. In no case shall injection pressure cause the movement of injection or formations fluids into underground sources of drinking water.

2) Injection between the outermost casing protecting USDWs and the well bore is not permitted.

3) The annulus should be filled with a fluid and pressurized.

In general, all injection wells have a limitation on the injection pressure. This limitation is set below some calculated fracture pressure which is representative of the geological conditions in the States. There are several methods and equations utilized for computing injection pressures. Most States set the injection pressure limitations based on a hydraulic fracturing gradient. The average injection pressure for Class I HW wells was found to be 572 psig, and 85% of the wells injected waste at less than 1,000 psig. Approximately 20% of wells in Figure VI-3 injected waste into formations by gravity flow. In this case minimum pressure was maintained only to keep the injected fluid moving through the pipes toward the injection wells. No formal investigation was conducted in this assessment to find out the reliability of the criteria applied in establishing the pressure limit by the States.

However, an analysis was made of the reported average bottom hole pressure in 94 out of the 195 active wells as compared with an "allowable" injection pressure. This "allowable" injection pressure was calculated by assuming a fracture gradient of 0.733 psi/ft which is a rather conservative number. Figure VI-3 shows this comparison. Out of the 94 wells only 4 appear to be injecting above this pressure. Additional analysis of the data revealed that:

FIGURE VI-2

STATUS OF UIC PERMITS (HW WELLS)
AS OF JANUARY 1985

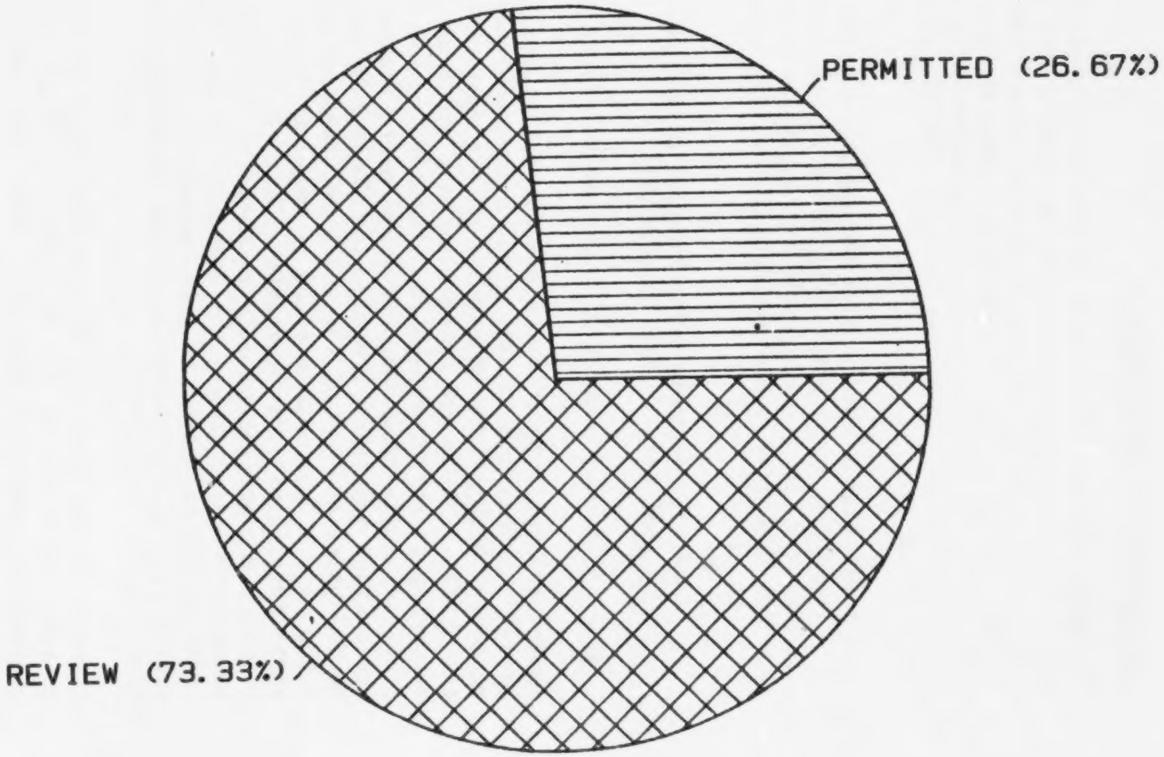
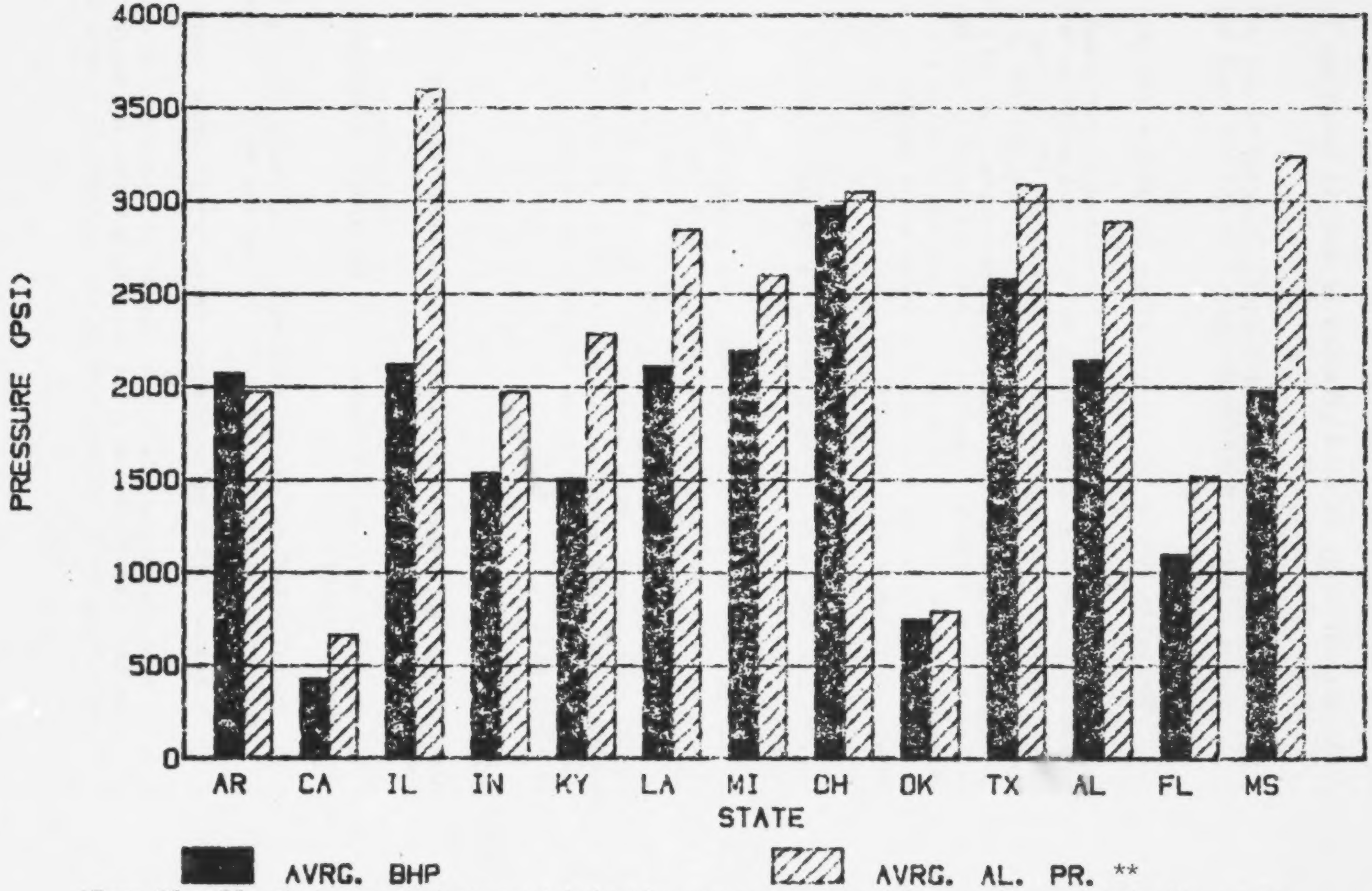


FIGURE VI-3

COMPARISON OF BOTTOM-HOLE PRESSURES *



*From 94 wells that reported average injection pressure, specific gravity and injection rate.

**Calculated using a fracture pressure gradient of 0.733 psi/ft. which may or may not be representative of the State structural geology. For comparison only.

1) One well injects at a pressure of 800 psi which may be high;

2) The specific gravity of the liquid injected in one well varies widely. The highest number (1.65) was used for the calculation;

3) Two wells inject into very shallow formations (in OK);

Determination of the suitability of formations to withstand the bottom hole pressure exerted on it by injection wells is not a simple process. In most cases the regulations controlling the injection pressure in a State are very conservative and it is the responsibility of the permittee to prove that the well can be operated at a higher than the allowable pressure. Of the cases described above it appears that the only problem may be in the two Oklahoma wells. This is because the apparently high injection pressure is compounded by the fact that these two wells inject into a very shallow formation in which the confining zone is very thin. The distance from the top to the injection zone to the bottom of the USDW in the two OK wells is less than 30 feet.

In all but one of the wells visited, the annulus between the casing and the tubing was filled with a fluid and pressurized. BASF Wyandotte in Michigan uses a fluid seal instead of a mechanical packer. In one of the wells, (Shell-Norco, LA), the annulus was filled with cement. This well will be abandoned in the near future. All other wells at the twenty facilities visited had the annulus filled with a fluid and isolated by the use of a packer or fluid seal.

6.5.2 Monitoring

Monitoring requirements for Class I wells under the UIC program include (40 CFR §146.13(b):

1) Analysis of injected fluids with sufficient frequency to be representative.

2) Installation and use of continuous monitoring devices for injection pressure, flow rate, volume and annulus pressure.

3) A demonstration of mechanical integrity at least every 5 years.

4) A plan that shows the types, number and location of wells in the Area of Review to be used to monitor any migration of fluids into and pressure in the underground source of

drinking water. Included in this plan there should also be a description of the parameters of the monitoring and its frequency.

5) Special requirements are also applicable for commercial (off-site) facilities. These facilities are covered under the manifest requirements of RCRA.

This next to last requirement appears to imply the need for monitoring wells. However, such a requirement is not clearly mandated in the UIC regulations. In the originally proposed UIC regulations there was a requirement for monitoring wells for Class I facilities. This requirement was relaxed in the final regulations as the result of comments to the effect that there was no technology that would define the siting of these monitoring wells. Furthermore, the drilling of multiple monitoring wells into a very deep interval would be prohibitively expensive. The final regulations have only a requirement for a plan showing the wells that would be monitored, and not a directive to drill monitoring wells. However, all facilities visited which have surface impoundments are equipped with shallow monitoring wells to detect ground-water contamination, required under the RCRA provisions. Unfortunately, their use for monitoring deep injection wells may not be very effective since they only monitor shallow aquifers.

Because the UIC program has not been fully implemented in most States there appeared to be no consistency in the scheduling of the analysis of injection fluids. However, there was a common practice for commercial activities to sample the waste from each client prior to injection. This practice was mainly for the purpose of justifying different disposal price structures and in some cases to determine compatibility of the equipment and the injection zone with the injection fluid. In most on-site operations, industries that manufacture different products sample regularly and usually every time the waste stream changes. However, depending on what information the State required from the operator, this information may or may not be available in the files. Once all States have put in place the requirements for their federally approved UIC program, specific waste information should be available,

Of the 181 wells which were active in 1983, 82 provided information regarding the frequency of injection analysis. Fifty four of these facilities conducted injection fluid analysis at least on a weekly basis. In general, the frequency of analysis varied in off-site facilities and they were conducted only when different types of waste were received. With the advent of full implementation of the UIC program, a more consistent injection fluid analysis program will be implemented.

In at least one case, frequent analysis could have alerted Louisiana State officials (if a program had been in place) of the potential for corrosion of the Rollins (previously CLAW) facility, due to the indiscriminate injection of all types of waste by its former owner.

All but two of the facilities visited in this assessment operated continuous monitoring instruments in their flow path. These instruments measure at least injection pressure, annulus pressure and pumping rate. In addition, many of these facilities have alarms and/or automatic shut-off systems to prevent any mishaps. In some facilities, an on-the-job operator monitors the operations 24 hours a day from the control room.

Inland Steel in East Chicago, Indiana was one of the facilities that did not monitor continuously. During the site visit of this facility it was observed that the injection pressure gauge on the facility's one injection well was not operational. Evidence also indicated that even when the gauge was operational, it was delivering inaccurate readings.

6.5.3 Reporting

Reporting requirements for Class I wells under the UIC program include (40 CFR §146.13(c)):

(1) The results of the analyses of the injection fluid including physical and chemical characteristics must be reported every quarter to the State Director (in the case of State UIC primacy) or the Regional Administrator (in the case of a Federally implemented program).

(2) All of the injection well characteristics that have been monitored and recorded continuously (injection pressure, flow-rate, volume, and annular pressure) should be reported quarterly as monthly averages, maximums and minimums.

(3) The results of each mechanical integrity test must be reported in the first quarterly report to the State Director or Regional Administrator after the test is completed.

(4) Every quarter, the number, locations, and types of monitoring wells within the area of review used to detect fluid migration into and pressure changes in underground sources of drinking water must be reported. The frequency of monitoring and characteristics to be monitored must be reported for each of the wells.

(5) The results of other injection well tests required by the State Director or Regional Administrator (as appropriate) and the results of any well work-overs should be reported in the first quarterly report after these have occurred.

(6) Report within 24 hours any violation that may cause contamination of a USDW.

Information on reporting could only be obtained from the twenty facilities visited. All of these facilities sent reports to the appropriate State agency regarding the items discussed above. Seven facilities sent reports monthly, seven quarterly, and six sent reports periodically but did not list the frequency. Nineteen of the facilities reported the monitoring information which was identified in the permit requirements. Only one of these facilities had refused to submit waste characteristics information to the State as of the time of the EPA visit. Since then this facility has agreed to report periodically.

From the information available it appears that most of the UIC requirements for monitoring and reporting are being fulfilled. When all the wells are repermitted under the UIC program, these requirements will be included as conditions for approval and/or corrective action.

6.6 Inspection and Surveillance

A surveillance program is usually associated with the efforts of the regulating entity to assure that the requirements of a program are followed. In following the concept of the "pathways of pollution" the surveillance program should assure that all the requirements for the particular facility (i.e., permit conditions, State regulations) are being followed in order to prevent pollution.

The tools used in surveillance are inspections and investigations. Inspections are routine procedures which are conducted periodically for all facilities. During an inspection the regulator should assure that all systems are operating properly and in accordance with the permit and the regulations. An investigation is usually originated by complaints, a pollution episode, suspicion of noncompliance, etc.

The UIC program under 40 CFR Part 145 Subpart B requires all States receiving delegation of the program to have inspection and surveillance procedures to determine independently, compliance or noncompliance by the regulated facility. To this effect the State has to maintain:

1) The capability to investigate compliance with permitting and other regulatory requirements;

2) The capability to inspect the regulated facilities periodically to determine: compliance or noncompliance with permit conditions and other requirements; accuracy of self-monitoring data; and adequacy of sampling and monitoring programs;

3) A program to investigate violations of permit conditions or other program requirements; and

4) The capability and mechanisms to receive and investigate information provided by the public related to violations.

To accomplish the above the State statute should give the UIC agencies: 1) the right of entry; 2) the right to copy reports on site; 3) the right to conduct investigations; and 4) the right to assess penalties to violators or to sue in civil and/or criminal court. This is required before delegation can be given to the State.

The amount of regulatory activity performed by State agencies on Class I HW facilities varies from State to State, depending on such factors as the number of active wells in the State, previous problems and historical practices of both industry and government. Under existing programs, all States require inspections of Class I wells but the frequency of such inspections varies.

Most States inspect wells annually or semi-annually, but three States have quarterly inspections, one has monthly inspections and two States inspect on a nonscheduled basis. The date of the last inspections at each facility and other relevant information is contained in the appendices.

Data collected during inspection depended on the activity occurring at each well at the time of inspection. For frequent, routine inspections, data collected by the State official was generally limited to operational parameters and would often include a check on compliance or obvious problems with surface features (gauges, piping, pumps, recording devices, tanks, signs, fences, etc.). In addition, where monitoring records were kept on-site, the records were usually reviewed for completeness and accuracy.

Some State agencies, notably in Arkansas, California, Louisiana, Oklahoma and Texas made attempts to witness or inspect mechanical integrity tests. Louisiana officials also inspected the records of such tests if they had not actually witnessed the test in operation. Most State agencies will inspect part of a workover operation, especially if such workover is mandated by an enforcement action. Only Florida, California, Ohio and Texas reported inspections of wells during initial construction.

6.7 Noncompliance and Enforcement*

The number of recorded permit noncompliance actions in each State was proportional to the number of Class I wells in the State. Texas and Louisiana, with the majority of wells, reported the greatest number of permit violations. There is no record of violations in Kansas, Kentucky and Mississippi.

The actions taken by State agency officials in cases of noncompliance were generally commensurate with the seriousness of the violations. Most minor violations such as paperwork deficiencies, improper recording devices, or lack of signs and barriers were corrected through an informal process of agreement between well operator and State agency. The inventory records indicated that for minor problems, such informal agreements were effective and resulted in the attainment of compliance.

For more serious violations, enforcement tools used by State agencies had included formal notices of violation, consent agreements and judicial action. These had been used in cases of failure to report data, well construction problems, loss of mechanical integrity, and exceeding pressure limitations.

Most of the serious cases of noncompliance had either been resolved to the satisfaction of the State agency or were in the process of being resolved. For those that were being resolved, they were apparently being corrected under agency auspices under an agreed-upon schedule.

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*The information in this section was mostly obtained from State files. It was assumed in the analysis of the data that the absence of information in the State's files indicated that the well was in compliance. In the more notorious cases, other sources were consulted. The reader should realize that in some of the major violations the State could have had corrections made by administrative or informal actions; while in a few less serious cases (e.g. reporting violations) the State may have had to resort to more drastic actions.

Figure VI-4 graphically summarizes compliance and enforcement actions. Graph A indicates that 29.8% of all off-site and on-site Class I HW wells in the United States have had a noncompliance record in State or EPA files. The occurrences of different types of noncompliance are depicted proportionately in graph B.

The most frequently occurring type of noncompliance, violation of monitoring and reporting requirements, accounted for 50% of all violations. The States' various responses to noncompliance are shown in Graph C, indicating that most violations have been resolved by administrative action. (Graph A also indicates that of the total percent of wells in noncompliance, 5.6%, were off-site wells However, since off-site wells constitute approximately 9.9% of the total, this would indicate that about 56% of all off-site wells were in noncompliance.) Table VI-3 shows the off-site facilities and wells in these facilities involved in noncompliance actions. Table VI-4 shows the on-site facilities and wells in these facilities involved in noncompliance actions.

In summary, of the total 112 facilities, only nine have had significant problems which could have resulted in contamination of USDWs. Of the nine, there is evidence that four did not contaminate USDWs as a result of injection. These five facilities are:

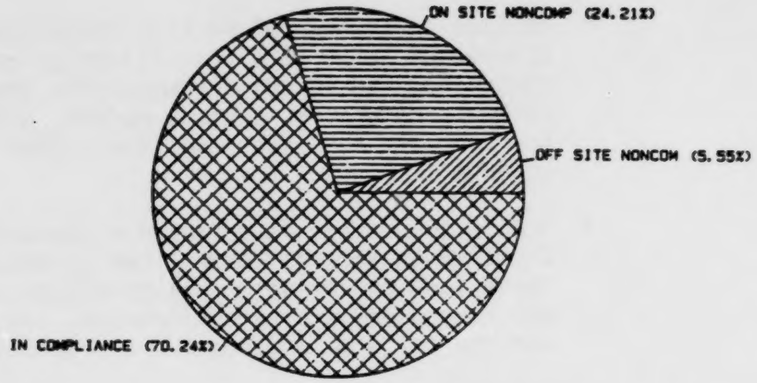
- Chemical Waste Management, an off-site facility in Ohio, did not discover leaks in the bottom part of the long string casing of their wells until large amounts of waste were injected into a shallower formation, which was separated from the bottom of the lowermost USDW by more than 1,500 feet, 1,000 feet of which is confining strata. This operational problem was detected during mechanical integrity tests conducted to obtain information for a UIC permit. The company has repaired five of the six problem wells and has been fined $12.5 million for these and other violations. The injection well that has not been repaired is not in operation and may be permanently abandoned.

- Leaks in the wells of the Chemical Resources, Inc., facility (off-site) in Oklahoma were discovered as a result of mechanical integrity tests performed as part of the implementation of the UIC program. This facility is also in violation of its permit requirements in other areas (e.g. injection pressure) and the State is pursuing legal action. The State has indicated that a permit will be denied to the present owner to operate this facility.

FIGURE VI-4

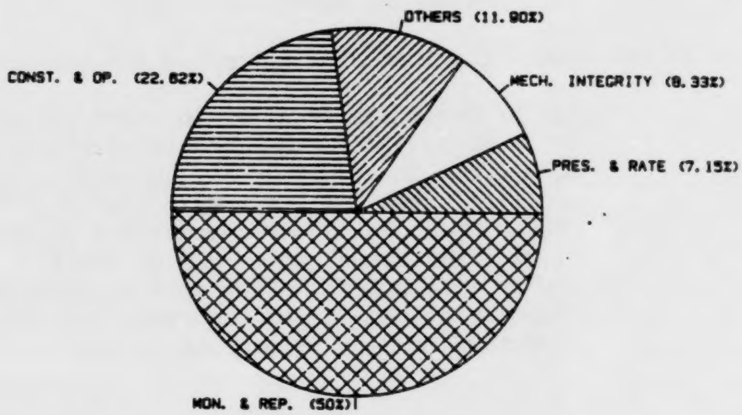
COMPLIANCE STATUS OF WELLS
TOTAL OF 252 WELLS IN 112 FACILITIES

GRAPH A



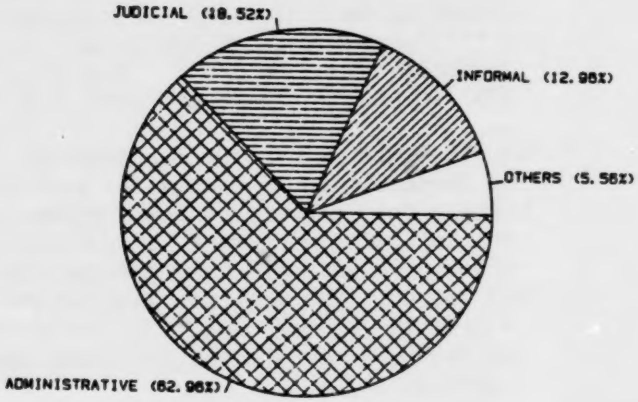
TYPES OF NONCOMPLIANCE
(BASED ON 84 NONCOMPLIANCE EPISODES)

GRAPH B



ACTION TAKEN BY STATE

GRAPH C



- Rollins Environmental Service (formerly CLAW) in Louisiana discovered leaks in a well allegedly resulting from the former owner's (CLAW) disregard for compatibility problems between the wastes, tubing, packer, and casing. Rollins has repaired the leaks and is pursuing legal action against CLAW.

- Sonics International operated a commercial (off-site) facility in Ranger, Texas. Due to shortcomings in the operations there was a well blow out. Fortunately, there was no ground-water contamination. The site was cleaned and the wells were plugged and properly abandoned.

- Browning-Ferris in Lake Charles, Louisiana contaminated a surficial aquifer at the site. The State does not believe the contamination resulted from injection, but rather from surface impoundments at the site. The State is investigating the cause.

In one case a final determination has not been made.

- At the Hercofina facility in North Carolina, waste migrated to a shallow formation because of inadequate cement in the borehole. The formation in question, the Black Greek, contains water ranging from < 150 to > 10,000 mg/l TDS. The State is continuing to investigate to determine whether the Black Greek formation is a USDW within 1/4 of a mile of the injection well. Two wells at this facility have been properly abandoned and the other two wells have ceased injection and are being used for monitoring.

There are three cases where USDWs have been contaminated as a result of injection wells:

- At the Hammermill facility in Erie, Pennsylvania, apparently because of excessive injection pressures, some of the injected waste migrated through the injection zone and reached an improperly abandoned well. The site, which was closed in 1975, is now on the "Superfund" list for remedial action.

- Shortly after Louisiana received UIC primacy, a well at the Tenneco site in Chalmette, Louisiana was found to be leaking into one of the lower USDWs (not considered potable). The contaminants consisted of "sour water" refinery waste which had corroded through both tubing and casing. The well was plugged and abandoned and Tenneco is cleaning up the contamination by the use of recovery wells, and reinjection into the permitted zone through several new injection wells.

- The Velsicol Chemical Corporation in Beaumont, Texas violated their permit with respect to pH. As a result, the casing corroded and injected fluid did enter an unauthorized injection zone, which contained formation water with a TDS content of 4,000 mg/l. Velsicol is using the injection well to clean up the contamination. In addition, wells were drilled and approximately 1.5 million gallons of water were pumped out.

All three of the confirmed and the one suspected episodes took place before UIC implementation in the States.

6.8 Financial Responsibility

The Underground Injection Control Regulations contain generic financial requirements to assure that the owner or operator of an injection well, has, or will have, the financial resources to properly plug and abandon the well at the end of its service life. The objectives of requiring financial assurances are the following:

(1) To close, plug, abandon an injection well using sound engineering and technical standards;

(2) To provide the finances to complete the entire plugging operation necessary according to the best practice available;

(3) To prevent the movement of fluids either into or between underground sources of drinking water.

The UIC regulations do not contain any requirements for "post-abandonment" monitoring (post-closure in RCRA) of the ground water, or any time limits or restrictions on subsequent care of the plugged and abandoned well.

The regulations require the Director (where the State has primacy, or Regional Administrator where EPA has direct implementation) to consider the following criterion when considering a permit application for a Class I, II, and III well:

> "A certificate that the applicant has assured through a performance bond, or other appropriate means, the resources necessary to close, plug, or abandon the well as required by 40 CFR §144.52(a)(7)".

TABLE VI-3 NONCOMPLIANCE EPISODES AT OFF-SITE FACILITIES

State	Company Name	Number of Wells Involved in Violation	Type of Noncompliance	Type of Enforcement Action	Agency	Resolution
Ohio	Chemical Waste Management, Inc.	6	All 6 wells failed mechanical integrity test	Judicial	State	Major workovers Company fined $12.5 million. Five wells back in operation.
Louisiana	Cecos-Browning-Ferris Industries	2	Monitoring and reporting deficiencies.	Notice of violation	State	Resolved
			Contamination episode	Judicial	State	May not be caused by well
Oklahoma	Chemical Resources, Inc.	1	Well construction, operation, monitoring and reporting deficiences	Judicial	State	Operating under consent agreement, civil action pending
Texas	Chaparral Disposal	1	Exceeded injection pressure limitation	Notice of violation	State	* —
	Empak	1	Exceeded injection rate	Administrative	State	Resolved
	Malone Service, Co.	1	Well operation, monitoring and reporting deficiencies	Notice of violation	State	* —
	Sonics International	2	Wells Blow-out	Administrative		Wells plugged and abandoned after site was cleaned up
	Total number of wells involved	14				

* — no information available

TABLE VI-4 NONCOMPLIANCE EPISODES AT ON-SITE FACILITIES

State	Company Name	Well Number Cited	Type of Noncompliance	Type of Enforcement Action	Agency	Resolution
Alabama	Stauffer	1	Crimp in casing, can't perform MIT.	Notice of violation	State	Well to be abandoned
Arkansas	Great Lakes Chemical Main Plant	2	Annulus pressure leak	Notice of violation	State	Pending
	Great Lakes Chemical South Plant	5	Annulus Leak	Notice of violation	State	Well was abandoned
Florida	Kaiser	1	Dissolved part of injection zone, bottom of casing broke off during work-over.	Informal	State	Corrected
Illinois	Allied Chemical Co.	1	Injection rate, pressure annulus, monitoring and reporting deficiencies	Informal	State	Corrective Action
	Cabot Corporation		Well blow out	*—		*—
	J&L Steel Corp. (LTV Steel)	1	Well construction and operation	Notice of violation	State	Workover
Indiana	General Electric	2	Monitoring & Reporting	*—	State	Well was abandoned
	Pfizer Mineral & Pigment Corp.	1	Hydrochloric Spill	*—	State	Well was abandoned
Louisiana	American Cyanamid, Co.	1	Monitoring and Reporting	Notice of violation	State	* —
		2	Monitoring and Reporting	Notice of violation	State	* —
		3	Monitoring and Reporting	Notice of violation	State	* —

* — no information available
** — not known if violation is related to injection facility

TABLE VI-4 NONCOMPLIANCE EPISODES AT ON-SITE FACILITIES (Cont.)

State	Company Name	Well Number Cited	Type of Noncompliance	Type of Enforcement Action	Agency	Resolution
Louisiana (cont.)	Borden Chemical, Co.	1	Monitoring and Reporting	Notice of violation	EPA	* —
		2	Monitoring and Reporting	Notice of violation	State	* —
		3	Monitoring and Reporting	Notice of violation	State	* —
	Chevron Chemical Co.	2	Monitoring and Reporting	Notice of violation	State	* —
		3	Monitoring and Reporting	Notice of violation	State	* —
	Citgo Petroleum Corp.	1	Well operation, Monitoring and Reporting	*—	State	* —
	International Minerals	1	Monitoring & Reporting	Informal	State	* —
		2	Monitoring & Reporting	Informal	State	* —
	Rubicon Chemical Inc.	2	Monitoring and Reporting	Notice of violation	State	* —
		1	Monitoring and Reporting	Notice of violation	State	* —

* — indicates no information available

TABLE VI-4 NONCOMPLIANCE EPISODES AT ON-SITE FACILITIES (Cont.)

State	Company Name	Well Number Cited	Type of Noncompliance	Type of Enforcement Action	Agency	Resolution
Louisiana (cont.)		3	Well operating and monitoring and reporting	Notice of violation	State	* —
	Shell Chemical Co.	4	Lack of inhibitor in annulur fluid	Notice of violation	State	* —
	Tenneco Chemical Co.		USDW contamination	Judicial	State	Aquifer restoration
		5	Lack of inhibitor in annulur fluid	Notice of violation	State	* —
	Texaco, Inc.	6	Monitoring and Reporting	Notice of violation	State	Recorder Installed
		1	Continuous Monitoring	Notice of violation	State	* —
		2	Monitoring and Reporting	Notice of violation	State	Recorder Installed
		5	Monitoring and Reporting	Notice of violation	State	* —
		6	Monitoring and Reporting	Notice of violation	State	Recorder Installed
		4	Monitoring and Reporting	Notice of violation	State	* —
	Universal Oil Products	5	Monitoring and Reporting	Notice of violation	State	Pending
		6	Monitoring and Reporting	Notice of violation	State	Pending
	Witco Chemical Corp.	1	Lacking ID #; Monitoring	Notice of violation	State	* —

* — no information available

TABLE VI-4 NONCOMPLIANCE EPISODES AT ON-SITE FACILITIES (cont.)

State	Company Name	Well Number Cited	Type of Noncompliance	Type of Enforcement Action	Agency	Resolution
Louisiana (cont.)		2	Annulus - injection tubing communication	Notice of violation	EPA	* —
Michigan	Hoskins Mfg. Co.	1	* —	Notice of violation	State	Hearings held
Ohio	Sohio	1	Contamination in monitoring wells Others	* —	State	Follow-up sampling did not confirm
		2	Contamination in monitoring wells	* —	State	Follow-up samples did not confirm
		3	Contamnation in monitoring wells	* —	State	Follow-up samples did not confirm
	U.S. Steel Corp.	2A	Communication to Annulus	Informal	State	*—
Oklahoma	American Airlines, Inc.	1	Failed mechanical integrity test	Notice of violation	State	* —
	Rockwell Internl.	1	Construction and other violations	* —	State	* —
Pennsylvania	Hammermill	All	USDW contamination	Judicial	State	Superfund site
Texas	Amoco Oil Co.	2	Exceeded permitted injection rate	* —	State	* —
	Empak	1	Exceeded permitted injection rate			

* — no information available

TABLE VI-4 NONCOMPLIANCE EPISODES AT ON-SITE FACILITIES (cont.)

State	Company Name	Well Number Cited	Type of Noncompliance	Type of Enforcement Action	Agency	Resolution
Texas (cont.)	General Aniline and Film Corp.	3	Exceeded permitted injection rate	* —	State	* —
	Monsanto-Chocolate Bayou	3	Exceeded permitted injection rate	* —	State	* —
	Velsicol		USDW contamination	Judicial	State	Aquifer restoration
	Witco	2	Injection & Annulus pressure	* —	State	* —

* — no information available

Section 144.52(a)(7) referenced above, states that the permittee is required to maintain and show evidence of financial responsibility. Financial mechanisms available to a permit applicant for a UIC permit may include surety or performance bonds, which are widely used in the business and industrial community, or other assurances, such as trust funds, escrow accounts, letters of credit, or financial statements. These instruments shift the liability for risk of damage or nonperformance to a third party, such as a bank. In this way, resources are available to close the well properly.

As one of the objectives of the requirements is to abandon the well using sound engineering practices, the regulations also require from the operator a plugging and abandonment plan which should include conditions that prevent contamination of USDWs. For EPA-administered programs the Agency is in the process of promulgating more specific requirements for Class I hazardous waste wells.

Financial assurance details were available for 8 of the 18 HW facilities visited. Two facilities apparently used a financial statement to provide coverage for abandonment: these were Stauffer Chemical in Alabama; and Allied Chemical in Illinois. The Chemical Resources well in Oklahoma used a letter of credit with a standby trust, but no information on the amount was available. Dupont and Monsanto in Texas used an asset trust to prove financial responsibility. Three other facilities - Rollins in Louisiana, Gibraltar and Empak in Texas - used bonding ranging from $75,000 to $99,000 to provide coverage for abandonment. Financial assurance had not been required on many injection wells in several States in the past. However, because the coverage for abandoning a well in a proper manner will be one of the permit conditions, all the wells have to prove financial responsibility and more data will become available as new UIC permits are issued, and existing wells are reissued permits under the UIC program.

6.9 Class IV Wells

Under the UIC program a Class IV well is one that injects hazardous or radioactive waste into or above a USDW (40 CFR §144.05(d)). Class IV wells were prohibited in 40 CFR §144.13. Through this regulation, all Class IV wells were banned ". . . except for injections associated with Federal activities [approved under

RCRA or CERCLA] designed to clean up an aquifer that has been contaminated by a hazardous waste site or similar source of contamination.". Under §144.23(c) operators are required to plug and abandon all Class IV wells within six months of the effective date of the EPA-administered program or within six months after delegation of the UIC program to a State. As discussed elsewhere in this report, the "Hazardous and Solid Wastes Amendment of 1984" has established a deadline for plugging Class IV wells of May 8, 1985.

APPENDICES

Foreword

These appendices have been organized in accordance to the 10 specific request for information in Section 701 of the Hazardous and Solid Waste Amendments of 1984. Only "raw" data is provided.

Organization

In accordance to the above paragraph, these appendices are organized as follows:

Section	Content
1	The location and depth of each well;
2	Engineering and construction details of each, including the thickness and composition of its casing, the width and content of the annulus, and pump pressure and capacity:
3	The hydrogeological characteristics of the overlying and underlying strata, as well as that into which the waste is injected;
4	The location and size of all drinking water aquifers penetrated by the well, or within a one-mile radius of the well, or within two hundred feet below the well injection point;
5	The location, capacity, and population served by each well providing drinking or irrigation water which is within a five-mile radius of the injection well;
6	The nature and volume of the waste injected during the one-year period immediately preceding the date of the report;
7	The dates and nature of the inspection of the injection well conducted by independent third parties or agents of State, Federal, or local government;
8	The name and address of all owners and operators of the well and any disposal facility associated with it;

Section	Content
9	The identification of all wells at which enforcement actions have been initiated under this Act (by reason of well failure, operator error, groundwater contamination or for other reasons) and an indentification of the wastes involved in such enforcement actions; and
10	Such other information as the Administrator may, in his discretion, deem necessary to define the scope and nature of hazardous waste disposal in the United States through underground injeciton.

SECTION 1

Data on

" The location and depth of each well;"

LOCATION AND DEPTH OF ALL CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	Lat	Long	DEPTH(FT)
AK	Arco Alaska Inc.	2*	70/14/00	148/29/00	2,217
		1*	70/14/00	148/29/00	2,200
AL	Stauffer Chemical Co.	3			4,728
		1			4,330
		2			4,600
AR	Ethyl Corp.	1	33/10/40	93/12/07	3,200
	Great Lakes Chemical Corp., Main plant	2	33/11/00	92/42/00?	3,003*
	Great Lakes Chemical Corp., South plant	3X			2,854
		4			2,860
		5			2,915
CA	Aerojet Strategic Propulsion Company	1	38/35/53	121/14/22	1,600
	Rio Bravo Disposal Facility	1	35/26/00	119/15/00	11,420
CO	SHELL OIL COMPANY				
	U.S. CORP. OF ENGINEERS AND CHEMICAL CORP.				
FL	Kaiser Aluminum & Chemical Co.	1	27/54/06	82/00/03	4,984
	Monsanto Company	3	30/35/00	87/15/00	1,664
		1	30/35/00	87/15/00	1,808
		2	30/35/00	87/15/00	1,654
IL	Allied Chem. Co.	1	40/20/00	87/45/00	4,000*
	Cabot Corp.	2			5,300
		1			5,318
	LTV Steel Company*	1	41/16/00	89/20/00	4,868
	Velsicol Corp.	1	39/24/38	87/41/44	2,634
		2	39/24/38	87/41/44	6,000
IN	Bethlehem Steel Corporation,Burn Harbor Plant	2*			4,290
		1*	41/37/58	87/07/08	4,292
	General Electric	2	37/54/23	87/55/26	2,878
		1	37/54/23	87/55/26	2,806
	Hoskins Manufacturing Co.	1			4,132
	Indiana Farm Bureau Cooperative	IN3	37/56/29	87/54/36	2,335*
	Inland Steel Company*	2	41/39/00	87/00/00	4,385
		1	41/39/07	87/27/42	4,333
	Midwest Steel	1*	41/37/46	87/10/10	4,296
	Pfizer Mineral and Pigment Co.	1*			4,506
		2*			4,528
	Uniroyal Inc. *	1			6,160
	United States Steel Corporation	IN9	41/27/27	87/21/59	4,291
KS	Sherwin Williams	3			2,427
		2			2,000
	Vulcan Materials Co.	4	37/15/00	97/25/15	4,600
		3	37/35/00	97/25/15	4,750
		7	27/35/00	97/25/15	4,650
		8	37/35/00	97/25/15	4,250
		9	37/35/00	97/25/15	4,600
KY	E.I. Dupont De Nemours & Co.	1	38/13/09	85/50/25	4,470
		2	38/12/55	85/50/32	4,470

LOCATION AND DEPTH OF ALL CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	Lat	Long	DEPTH(FT)
LA	American Cyanamid Co.	1	29/57/22	90/16/10	2,538
		2	29/57/19.2	90/16/9.6	3,302
		3	29/57/15.6	90/16/9.1	4,815
		4	29/57/17	90/60/10.5	5,010
		5	29/56/51.19	90/16/11.36	4,900
	Arcadian Corporation*	1	30/14/17	91/02/30	5,012
	Atlas Processing Co.	1	32/27/37.61	93/47/21.59	2,063.81
	BASF Wyandotte Corporation	D-1	30/11/52	91/00/04	5,900
	Borden Chemical Co.	1	30/13/50	91/00/30	3,472
		2	30/14/00	91/00/30	3,200
		3	30/13/50	91/00/30	3,715
	Browning-Ferris Industries (CECOS)	1	30/19/13	93/18/24	4,628
	Chevron Chemical Co.	2	29/48/00	90/00/30	2,852
		3	29/48/00	90/00/30	6,360
	Citgo Petroleum Corp.*	1	30/10/26	93/19/55	4,950
		2	30/10/26	93/19/48	5,000
		4			
		3			
	E. I. Dupont,Laplace	1	30/03/21	90/31/19	3,750*
		7	30/03/10	90/31/25	5,662
		6	30/03/53	90/31/27	5,815
		5	30/03/48	90/31/40	4,960
		4	30/03/35	90/31/35	5,058*
		3	30/03/09	90/31/27	5,132
		2	30/03/34	90/31/19	3,505*
	Ethyl Corp. of Baton Rouge	1	30/20/32	91/18/35	9,241*
	Georgia-Pacific Corporation	1	30/16/58	91/10/58	3,600
	International Minerals and Chemical Corp.	1	32/41/32.4	92/04/35.28	3,850*
		2	32/41/35.4	92/04/34.14	3,850
	Monsanto Chemical Company,Luling plant	1	29/55/20	90/21/30	3,401
		2	29/5//20	90/21/30	3,363
	NASA, Michoud Assembly Facility*	2	30/01/21	89/54/45	6,665
		1	30/01/21	89/54/45	6,665
	Rollins Environmental Services of LA,Inc	1			5,456*
	Rubicon Chemical Inc.	1	30/12/00	91/00/30	3,547
		2	30/12/00	91/00/30	3,788
		3	30/12/00	91/00/12	5,438
	Shell Chemical Company	5	30/12/00	91/00/00	2,544*
		4	30/12/00	91/00/11	4,022*
	Shell oil Company, East site	9	30/00/00	90/24/00	3,546*
		2			1,824*
		4	30/00/11	90/24/32	1,984*
		5	30/00/00	90/24/00	2,630*
		6	30/00/07	90/24/22	3,166*
		7	30/00/00	90/24/00	3,060*
		8	30/00/00	90/24/40	3,491*
	Shell Oil Company, West site	8	30/00/11	90/25/32	3,013
		2	30/00/30	90/24/30	1,676*
		5	30/00/20	90/25/35	1,832
		6	30/00/32	90/25/20	1,884*
		9	30/00/11	90/25/32	2,770*
	Stauffer Chemical Company	2	30/14/1.51	91/05/57	4,400
		1	30/14/2.25	91/06/3.6	4,400
		3	30/14/15.58	91/06/20.38	4,502
	TENNECO OIL COMPANY	?			

LOCATION AND DEPTH OF ALL CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	Lat	Long	DEPTH(FT)
		3	29/56/00	89/58/24.6	2,853
		4	29/55/57.72	89/58/25.8	2,900
	Texaco Inc.	5	30/06/00	90/53/00	3,616*
		4	30/06/40	90/54/17	3,935
		2	30/06/40	90/53/50	3,950
		1	30/06/40	90/54/05	4,110
		6	30/06/00	90/53/00	3,650*
	Uniroyal Inc.	1	30/12/7.1617	91/00/16	3,169*
		2	30/12/4.0146	91/00/12	3,794*
		3	30/12/5.581	91/00/14	4,775*
	Universal Oil Products	7	30/37/6.26	93/55/27	~9,000
		6	30/37/15.07	93/55/28.8	1,081
		5	30/37/18.25	93/55/38.4	1,102
	Witco Chemical Corporation,Gretna	1	29/54/48.72	90/04/33	7,162*
	Witco Chemical Corporation,Hahnville	1	29/58/51	90/27/13.8	1,710
		2	29/58/55.15	90/27/14.4	3,125*
	Wyandotte Chemical Corporation	D-2			
MI	BASF Wyandotte	1			
		2	42/37/45	86/07/51	5,910
		3	42/37/48	86/08/00	5,900
	Detroit Coke Company	1			4,231
		2	42/17/30	83/06/20	4,112
		3			4,127
	Dow Chem. Co.	5			
		2			3,978
		4			5,153
		8			5,150
	E.I. Dupont,Montaque	1	43/23/49	86/24/23	6,482
	Ford Motor Co., Rouge Steel	D-1			563
		D-2	42/18/00	83/09/03	4,308
	Hoskins Manufacturing Co.	1			
	Parke Davis & Co.	2			1,946
		1			1,635
		3			5,930
		4			5,931
	The Upjohn Co.	2			1,476
	Total Petroleum Inc.*	1	43/22/45	84/38/00	1,244
		2	43/22/45	84/38/00	3,622
	Velsicol Chem. Corp.	2			3,750
MS	Filtrol Corp.	1			5,671
NC	HERCOFINA	I6			1025
		17 A			1011
		OB 4			1050
		OB 5			1025
OH	Armco Steel Corp.	1			3,500
		2			3,500
	Calhio Chemical Inc.*	1			6,072
		2			6,100
	Chemical Waste Management, Inc.	6	to be determined	to be determined	2,955
		2	E9,843.720	N10,937.112	2,961
		3	E8,137.601	N0,010.259	2,960
		4	E9,065.457	N10,107.79	2,905

LOCATION AND DEPTH OF ALL CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	Lat	Long	DEPTH(FT)
		5	E5,384.289	N11,013.977	2,943
		1A	7,639.646	10,958.318	2,965
	Sohio Chemical Company, Vistron	1			3,135
		2			3,170
		3			3,170
	United States Steel Corporation	1	38/35/33.5	82/49/16	5,617
		2*	38/35/33	82/49/17	5,568
OK	Agrico Chem. co.	1	T-20N	R-15E Section 9	2,733
	American Airlines Inc.	2			3,093
		1			3,036
	Chemical Resources Inc.	1	36/06/25	96/01/10	3,364
	Kaiser	1	36/15/40	95/16/55	820
		2	36/15/40	95/16/55	789
	Rockwell International	1	36/12/00	95/54/00	3,100
	Somex	1			2,054
PA	Hammermill Paper Co.	3			1,601
		2			1,600
		1			1,650
TX	Amoco Oil Co.	5	29/22/07	94/55/40	
		4	29/22/09	94/55/40	
		3	29/22/36	94/55/14	7,000
		2	29/22/38	94/55/14	6,459
		1	29/22/30	94/55/24	6,950
	Arco Chem. CO., Lyondale plant	3	29/51/45	95/07/34	6,677
		2	29/49/01	95/06/28	7,242
		1	29/48/52	95/06/24	7,228
	Badische Corp.(Dow Badische Co.)	2	29/00/16	95/24/02	7,420
		1	29/00/16	95/24/05	6,200
	Browning - Ferris Industries	1			
	Celanese Chemical Co.	4	28/51/22	96/01/07	3,630
		1	28/51/47	96/01/20	5,939
		2	28/51/18	96/01/09-	3,780
		3	28/51/29	96/01/11	3,553
	Celanese Chemical Co.,Clear Lake plant	1	29/37/34	95/03/50	5,425
		2	29/37/43	95/03/53	5,420
	Champlin, Soltex & ICI, Corpus Christi Petro	2	27/48/40	97/36/03	7,450
		1	27/48/40	97/36/03	7,497
	Chaparral Disposal Co.(BFI)*	1	31/51/24	102/19/38	5,715
	Chemical Waste Management	1		27/42/48	4,800
	CHEMICAL WASTE MANAGEMENT,INC	1	29/52/15	94/06/00	7204
		2	29/52/15	94/06/00	
	Cominco American Inc.	1			
	Disposal Systems, Inc.	1	29/44/10	95/05/30	7,300
	E. I. Dupont,Beaumount	2	30/01/08	94/01/43	4,962
		1	30/01/09	94/01/51	5,015
	E. I. Dupont,Houston plant	1	29/41/58	95/02/22	7,000
		2	29/42/07	95/02/17	7,000
		3	29/41/52	95/02/25	5,770
	E. I. Dupont,Ingleside	3	27/52/28.7	97/14/38,4	5,268
		1	27/52/28.7	97/14/22.9	5,299*
		2	27/52/28.7	97/14/37.8	5,255*
	E. I. Dupont,Sabine River works	10	30/03/29	93/44/49	5,648

144<

LOCATION AND DEPTH OF ALL CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	Lat	Long	DEPTH(FT)
		9	30/03/06	93/45/18	
		8	30/03/06	93/44/30	5,063
		7			
		6	30/03/25	93/45/28	4,750
		ADN3	30/03/30	93/45/32	5,019
		4	30/03/24	93/45/15	5,059
		5	30/03/28	93/45/30	4,762 *
	E. I. Dupont,Victoria	2	28/40/35	96/57/08	4,693
		3	28/40/25	96/57/27	4,752.6
		4	28/40/28	96/57/05	4,690
		5	28/40/14	96/57/30	4,219
		6	28/40/08	96/57/39	3,810
		7	28/40/21	96/57/14	3,980
		8	28/40/34	96/57/28	4,555*
		9	28/40/32	96/57/12	4,000 *
		10	28/39/58	96/56/50	4,705
		1	28/40/16	96/57/45	4,875
	Empak, Inc.	1	29/44/25	95/05/40	7,518
	General Aniline and Film Corp.	1	29/25/30	94/57/59	4,028
		2	29/25/23	94/57/51	4,160
		3	29/25/41	94/57/31	3,912
	Gilbraltar Wastewaters, Inc.	1	32/27/42	95/10/48	
	Malone Service Co.	2			7,000
		1			5,124
	Merichem co.	1	29/45/34	95/10/40	7336
	Monsanto Chemical Co., Chocolate Bayou	4*			6,175 proposed
		1	29/14/51	95/12/49	6,409
		2	29/15/20	95/12/45	4,815*
		3	29/15/32	95/12/10	12,750
	Monsanto Co.	1	29/22/39	94/53/47	7,186*
		2	29/22/33	94/53/28.7	7,069
	Phillips Chemical Co.	D-2	35/43/06	101/25/36	5,075
		D-3	35/43/10	101/25/51	5,075
	Potash Co. of America Division	1	35/56/16	101/57/26	1,265
	Shell Chemical Co.	1	29/43/37	95/07/30 -	7,645
		2	29/43/06	95/07/24	7,645
	SONICS INTERNATIONAL	1			
		2			
	Velsicol Chemical Co.	2			
		1	29/58/11	94/03/36?	6,010
		3			5,750
	Vistron Corporation	1	28/33/57	96/50/14	8,250
		2	28/31/00	96/50/14	7,973
		3	28/34/03	96/50/08	7,530
	Waste-water Inc.	1	29/15/50	95/49/36	6,450
	Witco Chemical Co.,Houston	2	29/34/48	95/26/07	7,180
		1	29/34/45	95/26/05	7,410
	Witco Chemical Co.,Marshall	3	32/26/23	91/21/00	6,601
		2	32/36/26	94/20/59	2,526
WY	WYCON CHEMICAL COMPANY				

SECTION 2

Data on

> "Engineering and construction details of each, including the thickness and composition of its casing, the width and content of the annulus, and pump pressure and capacity;"

ENGINEERING DETAILS-SURFACE CASING INFORMATION,CLASS I HW

State	FACILITY NAME	WELL NO.	DIAM.	depth	grade	cemented to surf
AK	Arco Alaska Inc.	2*	13.37	100		
		1*	13.37	100		
AL	Stauffer Chemical Co.	3	16	150		
		1	16	32		
		2	16	125		
AR	Ethyl Corp.	1	13.38	160	48#	y
	Great Lakes Chemical Corp., Main plant	2	10.75	1,005.4	40#	
	Great Lakes Chemical Corp., South plant	3X	10.75	103		
		4	10.75	1,071		
		5	9.63	907	36#	
CA	Aerojet Strategic Propulsion Company	1	12.75	970	N-40,46#	y
	Rio Bravo Disposal Facility	1	13.38	2,566	C&D 64&54#	n
CO	SHELL OIL COMPANY					
	U.S. CORP. OF ENGINEERS AND CHEMICAL CORP.					
FL	Kaiser Aluminum & Chemical Co.	1	24	202		y
	Monsanto Company	3	30	106	carbon stl	y
		1	24	86	carbon stl	y
		2	16	110	steel	y
IL	Allied Chem. Co.	1	19.63	2,273	K-55,36#*	y
	Cabot Corp.	2	16	280		y
		1	8.63	816	24#	
	LTV Steel Company*	1	13.38	300	H-40,48#	y
	Velsicol Corp.	1	8.63	417	-	y
		2	13.38	77		
IN	Bethlehem Steel Corporation,Burn Harbor Plant	2*	13.37	219	H-40,48#	y
		1*	20	20	API,STD	y
	General Electric	2	13.38	186	H-40,48#	
		1	8.63			
	Hoskins Manufacturing Co.	1	8.62	412	K-55,24#	y
	Indiana Farm Bureau Cooperative	IN3	10.75	105	H-40,33#	y
	Inland Steel Company*	2	13.37	800	H-40,48#	y
		1	16	168	H-40,65#	y
	Midwest Steel	1*	16	180	J,26#	y
	Pfizer Mineral and Pigment Co.	1*	16	310		
		2*	20	341		
	Uniroyal Inc. *	1	10.75	498		y
	United States Steel Corporation	IN9	16	170	H-40,55#	
KS	Sherwin Williams	3	10.75	226	API	Y

ENGINEERING DETAILS-SURFACE CASING INFORMATION,CLASS I HW

State	FACILITY NAME	WELL NO.	DIAM.	depth	grade	cemented to surf
		2	9.63	200	steel	y
	Vulcan Materials Co.	4	16	163.56	API,65#	y
		3	10.75	401	H-40,33#	Y
		7	16	156	API,50#	y
		8	18	165	API,65#	y
		9	18	167	API,64#	Y
KY	E.I. Dupont De Nemours & Co.	1	18	125	H-40	y
		2	18	125	H-40	y
LA	American Cyanamid Co.	1	20	106.55		
		2	20	94.72		
		3	20	100		
		4	20	147		
		5	24	144		
	Arcadian Corporation*	1	20	200		y
	Atlas Processing Co.	1				
	BASF Wyandotte Corporation	D-1	10.75	900	4-J	y
	Borden Chemical Co.	1	13.38	1,010	H-40,48#	y
		2	13.38	1,016	H-40,47#	
		3	9.63		K-55	
	Browning-Ferris Industries (CECOS)	1	10.75	2,554	J-55,41#	y
	Chevron Chemical Co.	2	16	134	75#	y
		3	13.38	518	61	y
	Citgo Petroleum Corp.*	1	24	80		
		2	24	70		
		4				
		3				
	E. I. Dupont,Laplace	7	20	90	65#	
		6	16	100	65#	
		5	16	100	65#	
		4	16	100	65#	
		3	16	118	65#	
		2	16	68	65 ,41#	Y
		1	16	114	65#	
	Ethyl Corp. of Baton Rouge	1	20	116		
	Georgia-Pacific Corporation	1	16	791	H-40,65#	y
	International Minerals and Chemical Corp.	1	16	610		n
		2	16	81	NA	n
	Monsanto Chemical Company,Luling plant	1	13.38	1,235	K-55,55#	
		2	20	109		
	NASA, Michoud Assembly Facility*	2	16	60		
		1	16	60		
	Rollins Environmental Services of LA,Inc	1	13.38	2,505	55#	y
	Rubicon Chemical Inc.	1	13.38	802	K-55,36#	
		2	10.75	809	K-55,36#	

ENGINEERING DETAILS-SURFACE CASING INFORMATION,CLASS I HW

State	FACILITY NAME	WELL NO.	DIAM.	depth	grade	cemented to surf
		3				
	Shell Chemical Company	4	10.75	820	K-55,41#	y
		5	13.38	1,011		y
	Shell Oil Company, East site	4	14	100	55#	
		5	20	118	55#	
		6	20	106	55#	n
		7	20	121	J-55,78#	n
		8	20	145	B,94#	n
		9	20	145	A,94#	
		2	14	100	55#	
	Shell Oil Company, West site	8	16	166		n
		2	16	120	39#(Armco)	n
		5	20	117	65#,H-40	n
		6	20	97	65#,H-40	n
		9	16	152	NA	n
	Stauffer Chemical Company	2	16	72	85#	n
		1	16	67	84#	n
		3	16	79	55#	n
	TENNECO OIL COMPANY	?				
		3	13.38	1,320	K-55,61#*	y
		4	13.38	1,365	K-55,61#	y
	Texaco Inc.	5	24	83	171#	y
		4	16	1,008	40 & 65#s	y
		2	13.38	1,800	54#	Y
		1	20	60	78.6#	y
		6	24	88	171#	y
	Uniroyal Inc.	2	13.38	885	48#	y
		3	13.38	850	48#	y
		1	13.38	884	48#	y
	Universal Oil Products	7	16	212		
		6	8.63	156	28#	
		5	16	997	K-55,41#	
	Witco Chemical Corporation,Gretna	1	10.75	2,212	J-55,405#	y
	Witco Chemical Corporation,Hahnville	1	10.34	1,257	H-40,33#	y
		2	9.63	1,257	41#	y
	Wyandotte Chemical Corporation	D-2				
MI	BASF Wyandotte	1	10.75	539	H-40,33#	
		2	10.75	535	H-40,32#	y
		3	10.75	585	H-40,40#	y
	Detroit Coke Company	1	13.38	121	H-40,48#	y
		2	13.75	96	H-40,48#	y
		3	13.63	113	H-40,48#	y
	Dow Chem. Co.	5	13.38	1,382	54.5#	
		2	11.75	1,388	47#	
		4	18	86.7	H-40	

ENGINEERING DETAILS-SURFACE CASING INFORMATION,CLASS I HW

State	FACILITY NAME	WELL NO.	DIAM.	depth	grade	cemented to surf
		8	10.75	1,380	40.5#	
	E.I. Dupont,Montaque	1	20	106		
	Ford Motor Co., Rouge Steel	D-1	7	483	24#	
		D-2	13.38	137	H-40,48#	
	Hoskins Manufacturing Co.	1	10.75	640	J-55,41#	y
	Parke Davis & Co.	2	10.75	152	H-40,32#	Y
		1	10.5	125	42#	
		3	24	50	N	y
		4	20	41	N,90#	
	The Upjohn Co.	2	10.25	340	42#	y
	Total Petroleum Inc.*	1	10.75	452		y
		2	20	65	MR,60#	
	Velsicol Chem. Corp.	2	10.75	713	Y-B,32#	
MS	Filtrol Corp.	1	20	81	5-6	
NC	HERCOFINA	OB 5	20	85		Y
		I6	24"	850		Y
		17 A	18	127		Y
		OB 4	20	85		Y
OH	Armco Steel Corp.	1	13.38			y
		2	13.38	298		y
	Calhio Chemical Inc.*	1	10.75	512	32.75#	n
		2	16	40		y
	Chemical Waste Management, Inc.	6	10.75	651	46#	y
		2	13.75	629	H-40,41#	y
		3	10.75	661	H-40,41#	y
		4	10.75	646	H-40,41#	y
		5	10.75	654	41#	y
		1A	10.75	629	H-40,41#	y
	Sohio Chemical Company, Vistron	1	10.38	434	H-40	y
		2	10.38	504	H-40	y
		3	10	507		y
	United States Steel Corporation	1	10.75	500	J-55,41#	y
		2*	10.75	500	J-55,41#	y
OK	Agrico Chem. co.	1	20	40	X-42,65#	y
	American Airlines Inc.	2	13.37	460	Steel,55#	y
		1	10.75	416		y
	Chemical Resources Inc.	1	8.63	127	steel	y
	Kaiser	1	13.38	50		y
		2	8.63	397	J-55,24#	y
	Rockwell International	1	10.75	417	40.5	y
	Somex	1	10.75	176	29.4#	y
PA	Hammermill Paper Co.	3	13.37	58	H-40,40#	

ENGINEERING DETAILS-SURFACE CASING INFORMATION,CLASS I HW

State	FACILITY NAME	WELL NO.	DIAM.	depth	grade	cemented to surf
		2	13.37	79	H-40,40#	
		1	13.37	40	H-40,40#	
TX	Amoco Oil Co.	5				
		4				
		3	13.37	1,429	K-55,64.5#	y
		2	13.38	1,328	K-55,54.4#	y
		1	10.75	1,496	H-40,33#	y
	Arco Chem. CO., Lyondale plant	3	16	2,003	J-55	y
		2	13.38	2,561	K-55,61#	y
		1	13.38	2,526	K-55,61#	y
	Badische Corp.(Dow Badische Co.)	2	13.38	1,500	48#	y
		1	10.75	1,327		y
	Browning - Ferris Industries	1				
	Celanese Chemical Co.	4	10.75	1,389		
		1	13.38	1,394		y
		2	13.38	1,368	H-40,40#	y
		3	13.38	1,760	H-40	y
	Celanese Chemical Co.,Clear Lake plant	1	10.75	1,568	H-40,33#	y
		2	13.38	1314	H-40,48#	y
	Champlin, Soltex & ICI, Corpus Christi Petro	2	10.75	790	K-55,41#	y
		1	10.75	800	K-55,St&C	
	Chaparral Disposal Co.(BFI)*	1	13.38	407	unknown	y
	Chemical Waste Management	1	10.75	586		y
	CHEMICAL WASTE MANAGEMENT,INC	1	10.625	1006	CARB.STEEL	Y
		2				
	Cominco American Inc.	1				
	Disposal Systems, Inc.	1	8.63	2,827	K-55	y
	E. I. Dupont,Beaumount	2	13.38	1,617	H-40,48#	
		1	13.38	1,627	K-55 -	
	E. I. Dupont,Houston plant	1	10.75	1,103		y
		2	10.75	1,342	32.75#	
		3	13.37	1,485		
	E. I. Dupont,Ingleside	3	13.38	1,020	K-55	y
		1	13.38	1,018	K-55	y
		2	13.38	1,070	H-40,4816	y
	E. I. Dupont,Sabine River works	9	18.63		K-55,86#	
		10	13.38	1,605	J-55,54#	y
		8	13.38	2,596	J-55,54#	y
		7				
		6	9.63	1,638	J-55,40#	y
		ADN3	13.38	1,640		y
		5	9.63	1,638	40#,J-55	y
		4	13.38	1,616	J-55,48#	y
	E. I. Dupont,Victoria	2	10.75	1,951	J-55,41#	y
		3	10.75	1,993	J-55,41#	y

ENGINEERING DETAILS-SURFACE CASING INFORMATION, CLASS I HW

State	FACILITY NAME	WELL NO.	DIAM.	depth	grade	cemented to surf
		4	10.75	2,462	J-55,41#	y
		5	9.63	2,000	40#	y
		6	9.63	2,002	H-40,32#	y
		7	9.63	2,002	H-40,32#	y
		8	10.75	1,977	H-40,41#	y
		9	10.75	2,462	J-55,41#	y
		10	13.75	2,016	K-55,55#	y
		1	10.75	2,449	J-55,41#	y
	Empak, Inc.	1	10.76	2,830	J-55	y
	General Aniline and Film Corp.	1	13.38	1,043	45#	y
		2	13.38	981	68#	y
		3	13.38	1,230	54.5#	y
	Gilbraltar Wastewaters, Inc.	1				
	Malone Service Co.	1	10.38	1,212	H-40	
		2	10.38	1,200	K-55,46#	
	Merichem co.	1	10.75	2,727		y
	Monsanto Chemical Co., Chocolate Bayou	4*	13.38	100		
		3	30	60		y
		1	18	29		
		2	10.75	2,002	H-40,41#	y
	Monsanto Co.	1	13.38	1,578		y
		2	13.38	1,655	J-55,55#	y
	Phillips Chemical Co.	D-2	16	720	J-55,75#	y
		D-3	16	720	J-55,75#	y
	Potash Co. of America Division	1	8.6	1,110	K-55,24#	y
	Shell Chemical Co.	1	10.75	2,957	J-55,41#	y
		2	13.38	3,026	J-55	y
	SONICS INTERNATIONAL	1				
		2				
	Velsicol Chemical Co.	2				
		1	13.38	1,631	K-55,55#	y
		3	13.38	1,686	K-55,55#	y
	Vistron Corporation	1	13.38	~1,800	H-40,48#	
		2	13.38	1,825		y
		3	13.38	1,726		y
	Waste-water Inc.	1	9.63	1,360		y
	Witco Chemical Co.,Houston	2	10.75	2,690		y
		1	8.63	2,650	K-55	y
	Witco Chemical Co.,Marshall	3	10.75	668		y
		2	8.62	708		y
WY	WYCON CHEMICAL COMPANY					

ENGINEERING DETAILS-INTERMEDIATE STRING,CLASS I HW

State	FACILITY NAME	WELL NO.	DIAMETER	*	*	C
AK	Arco Alaska Inc.	2*				
		1*	5.5	2,200	N-80,17#	
AL	Stauffer Chemical Co.	3	10.75	1,312	J-55	
		1	10.75	1,237.78	H-40	
		2	10.75	1,334	J-55	
AR	Ethyl Corp.	1	8.63	3,200	32#	y
	Great Lakes Chemical Corp., Main plant	2	7	2,996	26#	
	Great Lakes Chemical Corp., South plant	3X	7	2,851	23#	
		4	7	2,854	steel	
		5	7	2,915.02	23#	
CA	Aerojet Strategic Propulsion Company	1	8.63	1,563	22#	y
	Rio Bravo Disposal Facility	1	7.63	11,385	D&X 39&34#	n
CO	SHELL OIL COMPANY					
	U.S. CORP. OF ENGINEERS AND CHEMICAL CORP.					
FL	Kaiser Aluminum & Chemical Co.	1	10.75	2,933	K-55,40.5	y
	Monsanto Company	3	18	1,190	ASTM A53	y
		1	18	982	carbon stel	y
		2	10	1,395	steel	y
IL	Allied Chem. Co.	1	7	3,700	K-55,26#	
	Cabot Corp.	2	10.3	1,590		y
		1	5.5	4,597	J-55,14#	
	LTV Steel Company*	1	9.63	2,703	J-55,36#	y
	Velsicol Corp.	1	4.5	1,540		y
		2	9.63	500		
IN	Bethlehem Steel Corporation,Burn Harbor Plant	2*	9.63	1,424	J-55,36#	y
		1*	10.75	3,800	H-40,32#	y
	General Electric	2	9.63	2,986	K-55,47#	
		1	4.5	2,760		
	Hoskins Manufacturing Co.	1	5.5	3,418	K-55,17#	y
	Indiana Farm Bureau Cooperative	IN3	5.5	2,335	H-40,14#	
	Inland Steel Company*	2				
		1	10.75	800	H-40,33#	y
	Midwest Steel	1*	10.5	400	J,26#	
	Pfizer Mineral and Pigment Co.	1*	10	605		
		2*	13.37	645	54#	
	Uniroyal Inc. *	1	7	5,450		
	United States Steel Corporation	IN9	10.75	811	H-40,41#	
KS	Sherwin Williams	3	7.63	1,423	API	Y

ENGINEERING DETAILS-INTERMEDIATE STRING,CLASS I HW

State	FACILITY NAME	WELL NO.	DIAMETER	*	*	C
		2	7.63	1,500	steel	y
	Vulcan Materials Co.	4	10.75	939	API,40.5#	y
		3				
		7	10.75	981	API,40.5#	y
		8	13.38	980	API,48#	Y
		9	13.38	950	API,48#	Y
KY	E.I. Dupont De Nemours & Co.	1	11.75	430	H-40	y
		2	11.75	430	H-40	y
LA	American Cyanamid Co.	1	11.75	2,538.56	J-55,47#	y
		2	11.75	3,275.33	J-55	y
		3	13.38	1,200	H-40,48#	y
		4	13.38	1,252	55#	y
		5	16	1,177	65#	y
	Arcadian Corporation*	1	13.38	1,582	J-55	
	Atlas Processing Co.	1				
	BASF Wyandotte Corporation	D-1		895	40#	y
	Borden Chemical Co.	1	9.63	3,330	C-75,38	y
		2	9.63	3,320	C-75,K-55	y
		3				
	Browning-Ferris Industries (CECOS)	1	7	2,527	K-55,26#	
	Chevron Chemical Co.	2	10.75	449	41#	y
		3	9.63	2,710	36	y
	Citgo Petroleum Corp.*	1	16	1,123	H-40,65#	
		2	16	1,101	H-40,65#	y
		4				
		3				
	E. I. Dupont,Laplace	7	13.38	1,000	H-40,48#	y
		6	9.63	1,028	32.75#	y
		5	9.63	1,006	33#	y
		4	10.75	1,014	40.5#	y
		3	10.75	1,048	40.5#	y
		2	10.75	1016	405 ,23#	y
		1	10.75	1,014	41#	y
	Ethyl Corp. of Baton Rouge	1	13.38	1,838	K-55,55#	y
	Georgia-Pacific Corporation	1	9.63	3,323	J-55,36#	y
	International Minerals and Chemical Corp.	1	10.75	2,447	K-55,41#	y
		2	10.75	2,495	K-55,40.5#	y
	Monsanto Chemical Company,Luling plant	1	9.63	3,277	K-55,40#	
		2	13.38	1,235	55#	y
	NASA, Michoud Assembly Facility*	2	11.75	1,174	J-55,47#	y
		1	11.75	1,174	J-55,47#	y
	Rollins Environmental Services of LA,Inc	1				
	Rubicon Chemical Inc.	1				
		2				

ENGINEERING DETAILS-INTERMEDIATE STRING,CLASS I HW

State	FACILITY NAME	WELL NO.	DIAMETER	*	*	C
		3	13.38	870	K-55,55#	y
	Shell Chemical Company	4	7.63	2,995	N-80,26#	y
		5	9.63	3,711	36,40,44 #s	y
	Shell Oil Company, East site	4	9.63	1,000	H-40,32#	y
		5	13.38	1,004	J-55,55#	y
		6	13.38	1,019	J-55,48#	y
		7	13.38	1,019		y
		8	13.38	1,018	K-55,55#	y
		9	13.38	1,014	K-55,55#	y
		2	9.63	1,000	H-5-40,32#	y
	Shell Oil Company, West site	8	10.75	1,345	K-55,41#	y
		2	10.75	1,840	41#,J-55	y
		5	13.38	975	48#,J-55	y
		6	13.38	1,020	55#,J-55	y
		9	10.75	1,322	K-55,41#	y
	Stauffer Chemical Company	2	10.75	908	8R,41 & 48#s	y
		1	10.38	900	41#	y
		3	10.75	1,002	J-55,40.5#	y
	TENNECO OIL COMPANY	?				
		3	8.63	2,850	J-55,28#	y
		4	8.63	2,900	J-55,28#	y
	Texaco Inc.	5	16	1,230	H-40,65#	y
		4	10.38	2,712	41#	y
		2	10.75	3,950	k-55,41#	Y
		1	13.38	1,939.6	J-55,55#	y
		6	16	1,185	65#	y
	Uniroyal Inc.	2				
		3				
		1				
	Universal Oil Products	7	10.75	1,955		
		6	7	1,100	J-55,26#	
		5				
	Witco Chemical Corporation,Gretna	1	7	7,267	23 & 26 #s	y
	Witco Chemical Corporation,Hahnville	1	7	3,637	23 & 25#s	y
		2	7	3,641	23 & 26#s	y
	Wyandotte Chemical Corporation	D-2				
MI	BASF Wyandotte	1	7	4,606	J-55,23#	
		2				
		3				
	Detroit Coke Company	1	8.63	1,774	J-55,24#	y
		2	9.63	631	H-40,32#	n
		3	9.63	872	H-40,32#	y
	Dow Chem. Co.	5	8.63	3,980	J-55,36#	
		2	8.63	3,740	J-55,36#	
		4	10.75	1,380	J-55,41#	

ENGINEERING DETAILS-INTERMEDIATE STRING,CLASS I HW

State	FACILITY NAME	WELL NO.	DIAMETER	*	*	C
		8	7	4,898	20#	
	E.I. Dupont,Montaque	1	13.38	790	K-55,55#	
	Ford Motor Co., Rouge Steel	D-1	5.5	192		
		D-2	9.63	664	H-40,32#	
	Hoskins Manufacturing Co.	1	5.5	2,688	K-55,14#	y
	Parke Davis & Co.	2	7	1,649	J-55,23#	Y
		1	7	1,435		
		3	13.38	279	N,48#	y
		4	13.38	277	N,48#	y
	The Upjohn Co.	2	7	1,276	17#	y
	Total Petroleum Inc.*	1				
		2	13.38	510	H-40,48#	y
	Velsicol Chem. Corp.	2	7	3,414	K-55,23#	
MS	Filtrol Corp.	1	13.38	1,627	H-40	
NC	HERCOFINA	OB 5	6	999		
		I6	8"	855		
		17 A	12	852		Y
		OB 4	6	999		
OH	Armco Steel Corp.	1	9.63			y
		2	9.63	2,946		y
	Calhio Chemical Inc.*	1	7	5,950	26#	n
		2	10.75	490	H-40,33#	y
	Chemical Waste Management, Inc.	6	7	2,730	J-55,23#	y
		2	7	2,370		y
		3	7	2,364	J-55,23#	y
		4	7	2,384	J-55,23#	y
		5	7	2,728	J-55,23#	y
		1A				y
	Sohio Chemical Company, Vistron	1	7	2,783	J-55,20#	y
		2	7	2,811	K,20#	y
		3	7	2,806		y
	United States Steel Corporation	1				
		2*				
OK	Agrico Chem. co.	1	13.38	200	K-55,54#	y
	American Airlines Inc.	2	9.63	1,740	K-55	y
		1	7	1,807	J-55,20#	y
	Chemical Resources Inc.	1	5.5	2,093	steel 15.5#	y
	Kaiser	1				
		2				
	Rockwell International	1				
	Somex	1	7	1,729	J-55,20#	y
PA	Hammermill Paper Co.	3	7	2,179	J-55,23#	y

ENGINEERING DETAILS-INTERMEDIATE STRING,CLASS I HW

State	FACILITY NAME	WELL NO.	DIAMETER	*	*	C
		2	7	5,100	J-55,23#	y
		1	7	2,106	J_55,23#	
TX	Amoco Oil Co.	5				
		4				
		3				
		2				
		1				
	Arco Chem. CO., Lyondale plant	3	7.63	6,960	J-55	y
		2	none	3		
		1	none			
	Badische Corp.(Dow Badische Co.)	2	9.63	6,900		y
		1	7	6,195		y
	Browning - Ferris Industries	1				
	Celanese Chemical Co.	4	7.63	3,368		
		1	9.63	5,635		y
		2	9.63	3,750	J-55,40#	y
		3	9.63	3,710	J-55	y
	Celanese Chemical Co.,Clear Lake plant	1				
		2	9.63	5,124	J-55,40.5#	y
	Champlin, Soltex & ICI, Corpus Christi Petro	2	7.63	7,114	K-55,26#	y
		1	7.63	7,191	K-55	y
	Chaparral Disposal Co.(BFI)*	1	7	4,875,4,808	K-55	y
	Chemical Waste Management	1	7	4,770		y
	CHEMICAL WASTE MANAGEMENT,INC	1	7.625	6996	CARB.STEEL	Y
		2				
	Cominco American Inc.	1				
	Disposal Systems, Inc.	1	5.5	7,104	K-55/FRP	
	E. I. Dupont,Beaumount	2	NA			
		1	NA			
	E. I. Dupont,Houston plant	1	7.63	5,170		
		2	7.63	4,842	K-55,26.4#	
		3	9.67	4,879		
	E. I. Dupont,Ingleside	3				
		1	8.63	5,114		y
		2	NA			
	E. I. Dupont,Sabine River works	9	11.75		K-55,54#	
		10				
		8				
		7				
		6	5.5	4,512	J-55,17#	y
		ADN3	9.63	2,717	40#	y
		5	5.5	4,500	17#,J-55	y
		4	9.63	4,877	J-55,40#	y
	E. I. Dupont,Victoria	2	NA			
		3	NA			

ENGINEERING DETAILS-INTERMEDIATE STRING,CLASS I HW

State	FACILITY NAME	WELL NO.	DIAMETER	*	*	C
		4	NA			
		5	NA			
		6	NA			
		7	NA			
		8	NA			
		9	NA			
		10	NA			
		1	NA			
	Empak, Inc.	1				
	General Aniline and Film Corp.	1				
		2				
		3				
	Gilbraltar Wastewaters, Inc.	1				
	Malone Service Co.	1	7	5,120	J-55,26#	
		2	7	7,000	K-55,26#	
	Merichem co.	1				
	Monsanto Chemical Co., Chocolate Bayou	4*	9.63	1,700	K-55,40#	y
		3	16	1,547	N-80,51#	y
		1	10.75	2,011	H-40,40#	y
		2				
	Monsanto Co.	1				
		2				
	Phillips Chemical Co.	D-2				
		D-3				
	Potash Co. of America Division	1				
	Shell Chemical Co.	1	7	7,645	N-80,23#	
		2	8.63	7,650	N-80	y
	SONICS INTERNATIONAL	1				
		2				
	Velsicol Chemical Co.	2				
		1	9.63	5,577	J-55,36#	
		3	9.63		J-55,36#	y
	Vistron Corporation	1	9.63	~6,000	N-80,47#	
		2	9.63	7,478		y
		3	9.63	6,382		y
	Waste-water Inc.	1	6.62	6,100		y
	Witco Chemical Co.,Houston	2	7	7,180		y
		1				
	Witco Chemical Co.,Marshall	3	4.5	6,601		
		2	5.5	2,434		
WY	WYCON CHEMICAL COMPANY					

ENGINEERING DETAILS-LONG STRING INFORMATION,CLASS I HW

State	FACILITY NAME	WELL NO.	DIAMETER	*	*	C
AK	Arco Alaska Inc.	2*	5.5	2,217	N-80,17#	
		1*		1,960	J-55,4.7#	
AL	Stauffer Chemical Co.	3	7	4,720	K-55	
		1	7	2,988.9	J-55	
		2	7	4,600	J-55	
AR	Ethyl Corp.	1				
	Great Lakes Chemical Corp., Main plant	2				
	Great Lakes Chemical Corp., South plant	3X				
		4				
		5				
CA	Aerojet Strategic Propulsion Company	1				
	Rio Bravo Disposal Facility	1	5	11,420	N-80,15#	n
CO	SHELL OIL COMPANY					
	U.S. CORP. OF ENGINEERS AND CHEMICAL CORP.					
FL	Kaiser Aluminum & Chemical Co.	1	7.63	4,008	N-80,26	y
	Monsanto Company	3	10.75*	1,314.5*	ASTM-A53B-E*	
		1	12	872-1,390	cs/ss	
		2	10	1,415	steel	y
IL	Allied Chem. Co.	1	7	3,537	fibgl,12#	
	Cabot Corp.	2	7.63	3,160		y
		1				
	LTV Steel Company*	1	7	3,066	J-55,23#	y
	Velsicol Corp.	1				
		2	7	2,440		
IN	Bethlehem Steel Corporation,Burn Harbor Plant	2*	7	2,510	J-55,23#	y
		1*	7	2,201	J-55,26#	y
	General Electric	2				
		1				
	Hoskins Manufacturing Co.	1				
	Indiana Farm Bureau Cooperative	IN3				
	Inland Steel Company*	2	9.62	2,495	K-55,36#	y
		1	7	2,283	J-55,26#	y
	Midwest Steel	1*	7	2,750	J,26#	
	Pfizer Mineral and Pigment Co.	1*	7	2,505		
		2*	8.62	2,590	K-55,24#	
	Uniroyal Inc. *	1				
	United States Steel Corporation	IN9	7.38	2,360	J-55,26#	
KS	Sherwin Williams	3				

ENGINEERING DETAILS-LONG STRING INFORMATION,CLASS I HW

State	FACILITY NAME	WELL NO.	DIAMETER	*	*	C
		2				
	Vulcan Materials Co.	4	7	3,979	26#	y
		3	7	4,124	J-55,26#	Y
		7	7	3,950	API,26#	y
		8	9.63	3,950	API,36#	Y
		9	9.63	3,950	API,36#	Y
KY	E.I. Dupont De Nemours & Co.	1	8.63	3,115	H-40	y
		2	8.63	3,115	H-40	y
LA	American Cyanamid Co.	1	9.63	2,292	36#	y
		2	9.63	3,215		y
		3	9.63	4,196	K-55,36#	
		4	9.63	4,144	K-55,40#	y
		5	13.38	4,015	k-55	y
	Arcadian Corporation*	1	9.63	4,800	K-55	
	Atlas Processing Co.	1				
	BASF Wyandotte Corporation	D-1	7	1,700	20#	y
	Borden Chemical Co.	1				
		2				
		3				
	Browning-Ferris Industries (CECOS)	1	7	8,683	N-80,26#	y
	Chevron Chemical Co.	2	7.63	2,749	26#	y
		3	7	6,348	29	y
	Citgo Petroleum Corp.*	1	10.75	4,740	K-55,46#	
		2	10.75	4,773	K-55,41-50#	y
		4				
		3				
	E. I. Dupont,Laplace	7*	9.63	5,070	40#	y
		6	5.5	6,497	17#	y
		5	5.5	5,140	17#	y
		4	7	4,826	23#	y
		3	7	5,226	26#	y
		2	7	5225	23# & 26#	y
		1	7	5,203	23#	y
	Ethyl Corp. of Baton Rouge	1	9.63	8,939	54# & 44#	y
	Georgia-Pacific Corporation	1	5.5	3,441	J-55,14#	n
	International Minerals and Chemical Corp.	1	7/6.75	3,723/3,784	K-55,26#/55	y
		2	7/6.75	3714/3775	K-55,26#	y
	Monsanto Chemical Company,Luling plant	1				
		2	9.63	3,277	40#	y
	NASA, Michoud Assembly Facility*	2	7.63	6,590	J-55,26#	n
		1	7.63	6,590	J-55,26#	y
	Rollins Environmental Services of LA,Inc	1	9.63	5,456	J-55,36#	y
	Rubicon Chemical Inc.	1	9.63	3,547	K-55,36#	
		2	7	3,626	K-55,20&23#	

ENGINEERING DETAILS-LONG STRING INFORMATION,CLASS I HW

State	FACILITY NAME	WELL NO.	DIAMETER	*	*	C
		3	9.62	5,300	K-55,40#	y
	Shell Chemical Company	4				
		5	7	2,600	N-80,26#	y
	Shell Oil Company, East site	4	7	1,9840	H-40,17#	n
		5	9.63	3,517	J-55,36#	y
		6	9.63	3,488	K-55,36#	y
		7	9.63	3,579	K-55,36#	y
		8	9.63	3,585	K-55,36#	y
		9	9.63	3,590	K-55,36#	y
		2	7	2,000	H-40,17#	n
	Shell Oil Company, West site	8	7	2,999	8# fbergls	y
		2	7.63	1,608	39#,P-110	y
		5	9.63	1,797	18#,J-55	y
		6	9.63	1,802	36#,J-55	y
		9	7	2,919	fibgls,8#	y
	Stauffer Chemical Company	2	7	4,400	26#	y
		1	7	4,400	23 & 26 #s	y
		3	7	4,500	J-55,26#	y
	TENNECO OIL COMPANY	?				
		3				
		4				
	Texaco Inc.	5	10.38	3,950	J-55,41#	y
		4	7	2,185	K-55,26#	n
		2	7	3,636	N-80,23#	N
		1	9.63	4,050	K-55,36#	y
		6	10.38	3,966	J-55,41#	y
	Uniroyal Inc.	2	9.63	3,614	36#	y
		3	9.63	4,670	J-55,36#	y
		1	9.63	3,070	K-55,36#	y
	Universal Oil Products	7	7.63	8,991	-	
		6				
		5	10.75	1,101	K-55,36#	
	Witco Chemical Corporation,Gretna	1				
	Witco Chemical Corporation,Hahnville	1				
		2				
	Wyandotte Chemical Corporation	D-2				
MI	BASF Wyandotte	1				
		2	7	4,700	J-55,23#	y
		3	7	4,340	K-55,23#	y
	Detroit Coke Company	1				
		2	7	4,109	K-40,23#	y
		3	7.63	3,750	J-55	y
	Dow Chem. Co.	5	7	3,690	J-55,20#	n
		2				
		4	7	4,967	J-55,23#	

ENGINEERING DETAILS-LONG STRING INFORMATION,CLASS I HW

State	FACILITY NAME	WELL NO.	DIAMETER	*	*	C
		8				
	E.I. Dupont,Montaque	1	7	5,460	K-55,26#	
	Ford Motor Co., Rouge Steel	D-1	5.5	472	K-55,14#	
		D-2	5.5	4,307	K-55,15.5#	
	Hoskins Manufacturing Co.	1				
	Parke Davis & Co.	2	4.5	1,648	10.5#	Y
		1				
		3	8.63	2,000	N,24#	y
		4	8.63	2,008	N,24#	N
	The Upjohn Co.	2				
	Total Petroleum Inc.*	1	7	1,025		y
		2	7	3,326	K-55,23#	
	Velsicol Chem. Corp.	2				
MS	Filtrol Corp.	1	9.63	4,413	K-55	
NC	HERCOFINA	OB 5				
		I6				
		17 A				
		OB 4				
OH	Armco Steel Corp.	1	7			
		2				
	Calhio Chemical Inc.*	1				
		2	7	5,410	K-55,26#	
	Chemical Waste Management, Inc.	6	5	NA	NA	
		2				
		3	5	2,810	J-55,15#	
		4	5	2,810	J-55,15#	
		5	NA	NA	NA	
		1A	7	2,370	-	
	Sohio Chemical Company, Vistron	1				
		2				
		3				
	United States Steel Corporation	1	7	5,617	N-80,26#	y
		2*	7	5,568	N-80,26#	y
OK	Agrico Chem. co.	1	9.63	1,506	K-55,36#	y
	American Airlines Inc.	2	9.63	1,770	40#	
		1				
	Chemical Resources Inc.	1	4.5	2,071	stell 10.25#	n
	Kaiser	1	8.63	358	H-40,32#	y
		2				
	Rockwell International	1	7	1,806	J-55,20#	y
	Somex	1	6.63	1,729-1,1751	sch-40	
PA	Hammermill Paper Co.	3	9.62	1,393	J-55,36#	y

ENGINEERING DETAILS-LONG STRING INFORMATION,CLASS I HW

State	FACILITY NAME	WELL NO.	DIAMETER	*	*	C
		2	9.62	2,538	J-55,36#	y
		1	9.62	1,359	J-55,36#	y
TX	Amoco Oil Co.	5				
		4				
		3	9.62	6,649	N-80	n
		2	9.62	6,102	K-55,N-80	y
		1	7.63	6,959	J-55,C75	n
	Arco Chem. CO., Lyondale plant	3				
		2	9.63	7,233	K-55,36#	y
		1	9.63	7,228	K-55,36#	y
	Badische Corp.(Dow Badische Co.)	2				
		1				
	Browning - Ferris Industries	1				
	Celanese Chemical Co.	4				
		1				
		2				
		3				
	Celanese Chemical Co.,Clear Lake plant	1	7	5,491	J-55,23#	y
		2				
	Champlin, Soltex & ICI, Corpus Christi Petro	2	3.5	7,470	SS-316,9#	n
		1	5.9116	9,494	SS-316	n
	Chaparral Disposal Co.(BFI)*	1	9.6	5,798	unknown	y
	Chemical Waste Management	1				
	CHEMICAL WASTE MANAGEMENT,INC	1	4.5	6885	FIBERGLASS	
		2				
	Cominco American Inc.	1				
	Disposal Systems, Inc.	1				
	E. I. Dupont,Beaumount	2	9.63	4813	K-55	
		1	9.63	4,847	K-55	
	E. I. Dupont,Houston plant	1				
		2				
		3				
	E. I. Dupont,Ingleside	3	9.63	5,055	K-55	y
		1	6.63	5,120	K-55	
		2	8.63	5,031	K-55,3616	y
	E. I. Dupont,Sabine River works	9	11.75		N-80,60#	
		10	9.63	3,682	J-55,40#	
		8	8.63	2,424	J-55-32#	
		7				
		6				
		ADN3	7.63	2,507-4,271	N-80,26.4#	y
		5	5.5	6,22	17#,Carp 20	y
		4				
	E. I. Dupont,Victoria	2	7	4,651	J-55,23#	y
		3	7	4,752	J-55,23#	y

ENGINEERING DETAILS-LONG STRING INFORMATION,CLASS I HW

State	FACILITY NAME	WELL NO.	DIAMETER	*	*	C
		4	7	4,673	J-55,23#	y
		5	5.5	4,203	304 S.S.,17#	y
		6	5.5	4,205	304 SS,17#	y
		7	5.5	4,366	304 SS,17#	y
		8	7	4,438	K-55,23#	y
		9	7	3,910	K-55,23#	y
		10	9.63	4,426	FT-304L S.S.	y
		1	7	4,822	N-80,23#	y
	Empak, Inc.	1	7	7,595	J-55	y
	General Aniline and Film Corp.	1	9.63	3,359	36#	y
		2	9.63	3,760	40#	y
		3	9.63	3520	40#	y
	Gilbraltar Wastewaters, Inc.	1				
	Malone Service Co.	1				
		2				
	Merichem co.	1	7	7,303	K-55,11.6#	y
	Monsanto Chemical Co., Chocolate Bayou	4*	7	5,855	K-55,23#	y
		3	10.75	3,300?	J-55,45#	
		1	7	6,320	J-55,26#	y
		2	7	6,372	J-55,26#	y
	Monsanto Co.	1	9.63	6,800	N-80,47#	y
		2	9.63	6,678	N-80,47#	y
	Phillips Chemical Co.	D-2	10.75	5,074	J-55,46.3#	n
		D-3	10.75	5,074	J-55,45.5#	n
	Potash Co. of America Division	1				
	Shell Chemical Co.	1				
		2				
	SONICS INTERNATIONAL	1				
		2				
	Velsicol Chemical Co.	2				
		1				
		3	9.63		S-80,40#	
	Vistron Corporation	1				
		2				
		3				
	Waste-water Inc.	1				
	Witco Chemical Co.,Houston	2				
		1	4.5	7,138	K-55	
	Witco Chemical Co.,Marshall	3				
		2				
WY	WYCON CHEMICAL COMPANY					

ENGINEERING DETAILS-TUBING AND COMPLETION INFO,CLASS I HW

State	FACILITY NAME	WELL NO.	tubing * *	*	*	C	COMPLETION
AK	Arco Alaska Inc.	2*	2.37	1,960	J-55,4.7#		
		1*	2.37		J-55,4.7#		
AL	Stauffer Chemical Co.	3	4.5	4,407	K-55		perforated
		1	4.5	3,400.8	H-40		perforated
		2	4.5				perforated
AR	Ethyl Corp.	1	5.5	2,991	K-55,17#		perforated
	Great Lakes Chemical Corp., Main plant	2	2.37	2,667			perforated
	Great Lakes Chemical Corp., South plant	3X	5.5	2,481			perforated
		4	5.5	2,540	K-55,14#		perforated
		5	5.5	2,676.84	17#		perforated
CA	Aerojet Strategic Propulsion Company	1	2.88	976	J-55		Perforated
	Rio Bravo Disposal Facility	1	2.87	9,757	N-80,6.5#		perforated
CO	SHELL OIL COMPANY						
	U.S. CORP. OF ENGINEERS AND CHEMICAL CORP.						
FL	Kaiser Aluminum & Chemical Co.	1	4.76	4,322		n	open hole
	Monsanto Company	3	6.0	1,386	stnless stl		open hole
		1	6	1,390	stnless stl		open hole
		2	6	1,417	stnles stl		open hole
IL	Allied Chem. Co.	1	2.87	3,642	fibercast		open hole
	Cabot Corp.	2	4.5	5,000	fibercast		open hole
		1	3.5	4,600+300			open hole
	LTV Steel Company*	1	4.5	3.091			open hole
	Velsicol Corp.	1	2.38	1,743			perforated
		2	4.5	2,428		-	open hole
IN	Bethlehem Steel Corporation,Burn Harbor Plant	2*	4.5	2,565	fiberglass		
		1*	3	2,223	J-55,9.3#		Perforated,open hole
	General Electric	2	4.5	2,600	K-55,12#		perforated
		1					open hole
	Hoskins Manufacturing Co.	1	2.88	3,382	J-55		
	Indiana Farm Bureau Cooperative	IN3	2	2,246	H-40,4.7#		open hole,screened
	Inland Steel Company*	2	4.5	2,500	fiberglass		
		1	3.5	2,583	fibercast		open hole
	Midwest Steel	1*	2	2,750	fibercast		open hole
	Pfizer Mineral and Pigment Co.	1*	3.10	2,471			open hole
		2*	4.5	2,640	fiberglass		open hole
	Uniroyal Inc. *	1					perforated
	United States Steel Corporation	IN9	4.5	2,600	fibercast		open hole
KS	Sherwin Williams	3	5.5	1,420			open hole

ENGINEERING DETAILS-TUBING AND COMPLETION INFO, CLASS I HW

State	FACILITY NAME	WELL NO.	tubing	"	"	"	"	C	COMPLETION
		2	5.5			1,500	steel		open hole
	Vulcan Materials Co.	4	4.5			3,980	Fibercast	N	open hole
		3	4.5			4,124	fibercast	N	open hole
		7	4.5			4,000	fibercast	n	open hole
		8	4.5			3,980	fibercast	N	open hole
		9	4.5			4,020	fibercast	N	open hole
KY	E.I. Dupont De Nemours & Co.	1	4.5			3,115	fiberglass	n	open hole
		2	4.5			3,115	fiberglass	n	open hole
LA	American Cyanamid Co.	1	7			2,046			perforated
		2	7			2,896	J-55		perforated
		3	7			2,950	K-55		perforated
		4	7			4,570	K-55		perforated
		5	9.63			4,810	k-55		perforated
	Arcadian Corporation*	1	6.63			4,775	3,1655		screened
	Atlas Processing Co.	1							perforated
	BASF Wyandotte Corporation	D-1	3.5			5,275	FRP,2000#		perforated
	Borden Chemical Co.	1	7			3,009	J-55,23#		screened
		2	7			3,228	K-55,23#		perforated
		3	7				AH-80,23#		screened
	Browning-Ferris Industries (CECOS)	1	3.5			4,439	FT,2.4#	n	perforated
	Chevron Chemical Co.	2	3.5			2,662	unknown	n	open hole
		3	3.5			5,433	unknown	n	perforated
	Citgo Petroleum Corp.*	1	7.63			4,390	K-55,26#		perforated
		2	7.63			4,673	K-55,26#		perforated
		4							
		3							
	E. I. Dupont,Laplace	7	6.63			4,600	26#		perforated
		6	2.38			5,773	4.7#	-	
		5	2.38			4,890	4.7#		perforated
		4	4.5			4,572	18#		screened
		3	4.5			4,138	11#		perforated
		2	3.5			2,372	9.3#	n	perforated
		1	4.5			2,464	10.5#		perforated
	Ethyl Corp. of Baton Rouge	1	2.88			9,090	J-55		perforated
	Georgia-Pacific Corporation	1	2.38			300	J-55	n	screened
	International Minerals and Chemical Corp.	1	4.5			3,746	304 sch. 40		screened
		2	4.5			3740	304 SCH 40	n	
	Monsanto Chemical Company,Luling plant	1	5.5			2,422	fiberglass		screened
		2	5.5			2,422			screened
	NASA, Michoud Assembly Facility*	2	5.5			4,856	J-55,16#		perforated
		1	5.5			~4,856	J-55,16#		perforated
	Rollins Environmental Services of LA,Inc	1	4.5			4,446	10 & 11 #s		perforated
	Rubicon Chemical Inc.	1	4.5			3,302	K-55,12&11 #		perforated
		2	4.5			3,417	K-55,12#		perforated

ENGINEERING DETAILS-TUBINGS AND COMPLETION INFO,CLASS I HW

State	FACILITY NAME	WELL NO.	tubing " "	"	"	C	COMPLETION
		3	7	5,199	K-55,26#		perforated
	Shell Chemical Company	4	4.5	4,124	fiberglass		perforated
		5	1.25	2,316	N-80,2#		perforated
	Shell Oil Company, East site	4	5.5	1,729	N-80,20#0		perforated
		5	7	1,962	J-55,23#		perforated
		6	7	1,905	J-55,23#	n	perforated
		7	7	2,686	K-55,23#	n	perforated
		8	7	2,691	K-55,23#	n	perforated
		9	7	2,593	K-55,26&25#		perforated
		2	5	1,952	N-80,18#		perforated
	Shell Oil Company, West site	8	4.5	2,570	3# fbergls	n	perforated
		2	5.5	1,548	18#,P110	n	perforated
		5	5	1,531	23#,N-80	y	peforated
		6	5.5	1,667	K-55,12&16#	n	perforated
		9	4.5	2,561	fibgls,3#	n	perforated
	Stauffer Chemical Company	2	4.5	3,628.64	K-55,11#		perforated
		1	4.5	4,018	K-55,11#		perforated
		3	4.5	4,454	K-55,10.5#	n	
	TENNECO OIL COMPANY	?					
		3	5.5	2,600			perforated
		4	5.5	2,620	J-55		screened
	Texaco Inc.	5	7	3,194	K-55,26#	n	perforated
		4	5.5	3,582	K-55,17#		perforated
		2	4.5	3,450	N-80,13#	N	perforated
		1	7	3,671	K-55,26#		perforated
		6	7	3,173	J-55	n	perforated
	Uniroyal Inc.	2	7	3,600	26#		screened
		3	7	4,521	J-55,26#		screened
		1	7	2,964	K-55,26#		perforated
	Universal Oil Products	7				-	
		6	5.56	980	A-53,27#		perforated
		5	8.63	988			perforated
	Witco Chemical Corporation,Gretna	1	4.5	6,765	23 & 26#		perforated
	Witco Chemical Corporation,Hahnville	1	4.5	1,438	J-55,11.6#	y	perforated
		2	4.5	2,235	N-80,13.6		perforated
	Wyandotte Chemical Corporation	D-2					
MI	BASF Wyandotte	1					
		2	3.5	4,873	FRP		open hole
		3	3.5	4,860	FRP		open hole
	Detroit Coke Company	1	2.5	3,526	J-55,6.5#		open hole
		2	4		J-55,12#		perforated
		3	4	3,702	J-55		open hole, perforated
	Dow Chem. Co.	5	5.5	3,665	J-55,15.5#		open hole
		2	3.5		J-55,9.3#		open hole
		4	3.5		J-55,9.3#		open hole

ENGINEERING DETAILS-TUBING AND COMPLETION INFO,CLASS I HW

State	FACILITY NAME	WELL NO.	tubing " "	"	"	C	COMPLETION
		8	5.5				open hole
	E.I. Dupont,Montaque	1	3.5	5,541			open hole
	Ford Motor Co., Rouge Steel	D-1	2	563	4.7#		open hole
		D-2	2.37		4.6#		perforated
	Hoskins Manufacturing Co.	1	2.75		TK-75		open hole
	Parke Davis & Co.	2	2.38	1,584	EVE		
		1			J-55		open hole
		3	3.5	4,894	J-55,9.3#		open hole
		4	3.5		J-55,9.3#		open hole
	The Upjohn Co.	2					
	Total Petroleum Inc.*	1	3.5		H-40		open hole
		2	4.5	3,331	K-55,10.5#		open hole
	Velsicol Chem. Corp.	2	5.5		K-55,17#		open hole
MS	Filtrol Corp.	1	4.5	5,670	fibercast		perforated
NC	HERCOFINA	OB 5					
		I6					
		17 A					
		OB 4					
OH	Armco Steel Corp.	1				y	open hole
		2	3.5	2,915	fibercast		open hole
	Calhio Chemical Inc.*	1	2.87	5,900	fiber.,7#		open hole, perforated
		2	3.5		K-75,9.3#		open hole, perforated
	Chemical Waste Management, Inc.	6	3.5	2,765	fiberglass		open hole
		2	3.5	2,800	fiberglass		open hole
		3	2.75	2,790	fiberglass		open hole
		4	2.75	2,808	fiberglass		open hole
		5	3.5		fiberglass		open hole
		1A	3.5	2,808	fiberglass	-y	open hole
	Sohio Chemical Company, Vistron	1	3.5				open hole
		2	4.5	2,809	W/TK-90,12#		open hole
		3	4.5	2,800			open hole
	United States Steel Corporation	1	3.5	5,519	N-80,9.3#	y	perforated
		2*	3.5	5,547	J-55,9.3#	y	perforated
OK	Agrico Chem. co.	1	6.63	1,478	fibercast	n	open hole
	American Airlines Inc.	2	5.5		K-55		open hole
		1	5.5	1,752	K-55,14#		open hole
	Chemical Resources Inc.	1	3.5	2,071	stnls.stl.		open hole
	Kaiser	1	4.5		CW55, 10.5#	n	open hole
		2	4.5		J-55,9.5#	n	open hole
	Rockwell International	1	4.5	1,816	K-55,12#	n	open hole
	Somex	1	3.5	~1746	fiberglass		open hole
PA	Hammermill Paper Co.	3	5	1,601	fiberglass	y	open hole?

ENGINEERING DETAILS-TUBING AND COMPLETION INFO,CLASS I HW

State	FACILITY NAME	WELL NO.	tubing	"	"	"	"	C	COMPLETION
		2	5			1,600	fiberglass	y	selectojetted?
		1	4.5			1,650	fiberglass	y	perforated
TX	Amoco Oil Co.	5							
		4							
		3	7			5,814	K-55,26#	n	open hole
		2	7			5,970	K-55,26#	n	screen and gravel pack
		1	5.5			5,372	J-55,155#	n	perforated
	Arco Chem. CO., Lyondale plant	3	4.5			6,295			perforated
		2	5.5			6,345	K-55,15.5#	n	perforated
		1	4.5			6,308	K-55,40#	n	perforated
	Badische Corp.(Dow Badische Co.)	2	4.5			6,820	11.6#	y	open hole
		1	4.5			6,043		y	perforated
	Browning - Ferris Industries	1							
	Celanese Chemical Co.	4	5.5			3,323			screened
		1	6.63			4,650	fiberglass		screened
		2	5.5			3,200	J-55		perforated
		3	5.5			3,200			screened
	Celanese Chemical Co.,Clear Lake plant	1	4.5			5,201	fiberglass	y	screened with gravel pack
		2	4.5			2,579-5,200	fiberglass	n	screened and gravel pack
	Champlin, Soltex & ICI, Corpus Christi Petro	2	3.5			7,168	TFP,3.76#	n	screened
		1	3.5			7,130	Carbon-steel	n	perforated
	Chaparral Disposal Co.(BFI)*	1	2.6			4,805	unknown	n	perforated
	Chemical Waste Management	1	2.875			4,585	fiberglass		perforated
	CHEMICAL WASTE MANAGEMENT,INC	1							
		2							
	Cominco American Inc.	1							
	Disposal Systems, Inc.	1	2.87			6,745	fiberglass		perforated 82/04/00
	E. I. Dupont,Beaumount	2	7			4,180	K-55,26#		screened
		1	7			4,078	K-55	-	screened
	E. I. Dupont,Houston plant	1	4.5				fiberglass		screened
		2	4.5			4,820	fiberglass		screened
		3	7			5,137	fiberglass		screened
	E. I. Dupont,Ingleside	3	4.5			4,982	fibercast	n	screened
		1	4.5			5,197			screened
		2	3.5			4,020	Steel	n	screened
	E. I. Dupont,Sabine River works	9	6.63				316ss,17#		screened
		10	5.5			5,339	316-L,sst		screened
		8	4.5			4,048	sch. 40		screened
		7							
		6	2.88			4,498	K-55,6.5#		perforated
		ADN3	5.5			4,278	3,16ss.17#	n	screened
		5	3.5				9.2#	n	screened
		4	5.5			4,467	316ss,17#	n	screened
	E. I. Dupont,Victoria	2	4.5			3,800	K-55,12#	n	perforated
		3	4.5			3,251	K-55,12#	n	perforated

ENGINEERING DETAILS-TUBING AND COMPLETION INFO,CLASS I HW

State	FACILITY NAME	WELL NO.	tubing	"	"	"	"	C	COMPLETION
		4	4.5			3,064	K-55,12#	n	perforated
		5	3.5			3,020	304 S.S.,19#	n	perforated
		6	3.5			3,005	304 S.S,19#	n	perforated
		7	3.5			3,020	304 SS,9#	n	perforated
		8	4.5			3,780	K-55,12#	n	perforated
		9	4.5			3,877	K-55,12#	n	screened
		10	6.63			4,180	304 S.S.,40#	n	perforated
		1	4.5			3,170	K-55,12#	n	perforated
	Empak, Inc.	1						n	perforated
	General Aniline and Film Corp.	1	4.5			3,351/3,346	K-55		screeened
		2	4.5			4,160			screened
		3	4.5			3,546	K-55		screened
	Gilbraltar Wastewaters, Inc.	1							perforated
	Malone Service Co.	1	3.5			4,872	J-55,10#		perforated
		2	4.5				K-55,11#		
	Merichem co.	1	4.5			6,491		n	perforated
	Monsanto Chemical Co., Chocolate Bayou	4*	3.5			5,985	Zirconium		screened
		3	7.63			5,991			perforated
		1	5			3,500	J-55,15#		perforated
		2	5.5			3,988	N-80,17#		screened
	Monsanto Co.	1	7			6,682	N-80 & K-55	n	screened
		2	7			6,526	fiberglass	n	screened
	Phillips Chemical Co.	D-2	7			3,805	J-55,23#		perforated
		D-3	7			3,745	J-55,23#		perforated
	Potash Co. of America Division	1	3.5			1,131	fibercast	y	
	Shell Chemical Co.	1	3.5			6,800	plastic coat		perforated
		2	4.5			6,755	plastic coat		perforated
	SONICS INTERNATIONAL	1							
		2							
	Velsicol Chemical Co.	2							
		1	4.5			3,941	EVE		perforated
		3	4.5			4,609	EVE		perforated
	Vistron Corporation	1	5.5			5,100			perforated
		2	5.5			7,250			screened
		3	5.5			6,717			perforated
	Waste-water Inc.	1							screened
	Witco Chemical Co.,Houston	2	4.5						perforated
		1	2.38			7,134	J-55		perforated
	Witco Chemical Co.,Marshall	3	2.38			5,650			perforated
		2	2.38						perforated
WY	WYCON CHEMICAL COMPANY								

ENGINEERING DETAILS-PRESSURE INFO,CLASS I HW

State	FACILITY NAME	WELL NO.	Min	Avg	Max	Actual	Design	Permit
AK	Arco Alaska Inc.	2*		700	1,400			
		1*		700	1400			
AL	Stauffer Chemical Co.	3						
		1		215				
		2		250				
AR	Ethyl Corp.	1	100	375	700	375		
	Great Lakes Chemical Corp., Main plant	2	100	150	700	125		
	Great Lakes Chemical Corp., South plant	3X						
		4						
		5						
CA	Aerojet Strategic Propulsion Company	1	30	16.3	1.6	29*	300*	55
	Rio Bravo Disposal Facility	1		2000	3,500			
CO	SHELL OIL COMPANY							
	U.S. CORP. OF ENGINEERS AND CHEMICAL CORP.							
FL	Kaiser Aluminum & Chemical Co.	1	65	145	185			
	Monsanto Company	3	135	140	175			200
		1	135	140	175			200
		2	135	140	175			200
IL	Allied Chem. Co.	1	-20	0	80	0	485	100
	Cabot Corp.	2	4	17	30			
		1						
	LTV Steel Company*	1	0	0	100	41*		340
	Velsicol Corp.	1						
		2						
IN	Bethlehem Steel Corporation, Burn Harbor Plant	2*		838				
		1*	0	51	65			
	General Electric	2						
		1						
	Hoskins Manufacturing Co.	1		300				
	Indiana Farm Bureau Cooperative	IN3	100	200	350	200	none?	none?
	Inland Steel Company*	2		143	791			
		1		58	270			
	Midwest Steel	1*			30	53	NA	600*
	Pfizer Mineral and Pigment Co.	1*						
		2*		250				
	Uniroyal Inc. *	1	400	800	1,200			
	United States Steel Corporation	IN9	NA	NA	NA	0	0	none
KS	Sherwin Williams	3						

ENGINEERING DETAILS-PRESSURE INFO, CLASS I HW

State	FACILITY NAME	WELL NO.	Min	Avg	Max	Actual	Design	Permit
		2						
	Vulcan Materials Co.	4	-20	0	100" Hg	-8.7	0	0
		3	-20	-5	0	-2.5	0	0
		7	-30	-12	0" Hg	-5.1	0	0
		8	-35	-25	0	-13.6	0	0
		9	-25	-10	10	-6.1	0	0
KY	E.I. Dupont De Nemours & Co.	1	14.7	17.2	19.7 psia	17.2	2,000	85
		2	14.7	17.2	19.7	17.2	2,000	85
LA	American Cyanamid Co.	1						
		2						
		3						
		4						
		5						
	Arcadian Corporation*	1				NA	250	NA
	Atlas Processing Co.	1						
	BASF Wyandotte Corporation	D-1	-5.8	-5.3	2.9	-5.8		
	Borden Chemical Co.	1	300	500	700			
		2	300	500	700			
		3	300	500	700			
	Browning-Ferris Industries (CECOS)	1	1050	1200	1350	vary	1200	1500
	Chevron Chemical Co.	2	NA	560	770	560	NA	NA
		3	NA	660	830	660	NA	NA
	Citgo Petroleum Corp.*	1		670	900	670		
		2		665	900	665		
		4						
		3						
	E. I. Dupont, Laplace	7	<100	200	520	420	<100	1000
		6				-		
		5						
		4	50	300	600	165	<100	1080
		3	70	300	600	69	<100	1000
		2	20	250	460	207	<100	430
		1	80	180	450	144	<100	460
	Ethyl Corp. of Bàton Rouge	1	-15	-10	-5	-10	-10	none
	Georgia-Pacific Corporation	1						
	International Minerals and Chemical Corp.	1	90	110	240	90		
		2	90	110	240	110		
	Monsanto Chemical Company, Luling plant	1		352				
		2		307				
	NASA, Michoud Assembly Facility*	2		1430				
		1		1430				
	Rollins Environmental Services of LA, Inc	1						
	Rubicon Chemical Inc.	1		335				
		2		400				

ENGINEERING DETAILS-PRESSURE INFO,CLASS I HW

State	FACILITY NAME	WELL NO.	Min	Avg	Max	Actual	Design	Permit
		3		335				
	Shell Chemical Company	4	085	208	230	180	0	
		5						
	Shell Oil Company, East site	4	200		460			
		5	200		470	200		
		6	100		500	175		
		7	110		500	150		
		8	160		460	250		
		9	110		440	275		
		2						
	Shell Oil Company, West site	8	0		220	0		
		2	50		280	60		
		5	60		225	69		
		6	50	280		70		
		9	0		220	60		
	Stauffer Chemical Company	2	0	150	375	100	600	
		1	100	250	400	300	600	
		3	0	100	200	250	600	400
	TENNECO OIL COMPANY	?						
		3	200	192	350	192	375	
		4	200	263	325	198	375	
	Texaco Inc.	5				0	650	
		4	380	453	540	453	650	
		2				0	650	
		1	217	238	260	0	650	
		6		101		0	650	
	Uniroyal Inc.	2		480		450		779
		3		420		450		1043
		1		216		300		630
	Universal Oil Products	7				-		
		6		230				
		5		670				
	Witco Chemical Corporation,Gretna	1	50	466		466	700	1000
	Witco Chemical Corporation,Hahnville	1	100	250	400	250	1,500	N
		2	300	600		350	1,500	N
	Wyandotte Chemical Corporation	D-2						
MI	BASF Wyandotte	1						
		2			1,200			NA
		3			1,200			NA
	Detroit Coke Company	1		800				
		2						
		3						
	Dow Chem. Co.	5						
		2						
		4						

ENGINEERING DETAILS-PRESSURE INFO,CLASS I HW

State	FACILITY NAME	WELL NO.	Min	Avg	Max	Actual	Design	Permit
		8						
	E.I. Dupont,Montaque	1		0				
	Ford Motor Co., Rouge Steel	D-1		134				
		D-2						
	Hoskins Manufacturing Co.	1						
	Parke Davis & Co.	2			700			
		1						
		3		439				
		4		520				
	The Upjohn Co.	2						
	Total Petroleum Inc.*	1						
		2	300	500	700	300		*
	Velsicol Chem. Corp.	2	60	65	70			
MS	Filtrol Corp.	1		.220				
NC	HERCOFINA	OB 5				150		
		I6				150+	150	150
		17 A				150+	150	
		OB 4				150		
OH	Armco Steel Corp.	1			30			
		2			30			
	Calhio Chemical Inc.*	1		1400				
		2						
	Chemical Waste Management, Inc.	6	0					
		2	0	0	0		790	
		3	0	700	83/06/00	700	1000	790
		4	0	700	790	700	1000	790
		5	0					790
		1A	0	700	790	760	790	790
	Sohio Chemical Company, Vistron	1						
		2						
		3						
	United States Steel Corporation	1	1424	1466	1517	1450		1702
		2*	1480	1557	1595	1,640		1,702
OK	Agrico Chem. co.	1	100	280	320	280	375	320
	American Airlines Inc.	2						
		1	345	400	490			600
	Chemical Resources Inc.	1	0	408	815			
	Kaiser	1	90	200	250	250	400	250
		2	0	200	205	240	400	250
	Rockwell International	1	0	245	275	245	270	275
	Somex	1						
PA	Hammermill Paper Co.	3						

ENGINEERING DETAILS-PRESSURE INFO,CLASS I HW

State	FACILITY NAME	WELL NO.	Min	Avg	Max	Actual	Design	Permit
		2						
		1		121				
TX	Amoco Oil Co.	5						
		4						
		3		777		600*	2500	1000
		2		372		600*	2500	1000
		1				650*	2500	1000
	Arco Chem. CO., Lyondale plant	3			1,500			
		2	0	321	700	170	1000	1000
		1	0	233	390	150	1000	1000
	Badische Corp. (Dow Badische Co.)	2					1050	1050
		1		539		500	1050	1050
	Browning - Ferris Industries	1						
	Celanese Chemical Co.	4		303				
		1		180				
		2		201				
		3		340				
	Celanese Chemical Co., Clear Lake plant	1		636				1000
		2						1000
	Champlin, Soltex & ICI, Corpus Christi Petro	2	0	40	415	0	1500	1500
		1	0	40	415	0	1500	1500
	Chaparral Disposal Co. (BFI)*	1	300	1403	1417	1417	2210	2210
	Chemical Waste Management	1		265				
	CHEMICAL WASTE MANAGEMENT, INC	1			400			
		2						
	Cominco American Inc.	1						
	Disposal Systems, Inc.	1	VAC	92.3	1300	100	1500	1300
	E. I. Dupont, Beaumount	2	0	800	1500	635	1500	1500
		1	0	750	1500	657	1500	1500
	E. I. Dupont, Houston plant	1			2000			
		2						
		3		556				
	E. I. Dupont, Ingleside	3				-14.1		850
		1			2,000			
		2			850	-48.5		850
	E. I. Dupont, Sabine River works	9						1,200
		10						950
		8						850
		7						
		6		941	970			1500
		ADN3		553	918			1500
		5		857	1,410			1,500
		4		535	847			1500
	E. I. Dupont, Victoria	2	0	500	1000	835	1000	1000
		3	0	500	1000	815	1000	1000

ENGINEERING DETAILS-PRESSURE INFO,CLASS I HW

State	FACILITY NAME	WELL NO.	Min	Avg	Max	Actual	Design	Permit
		4	0	500	1000	830	1000	1000
		5	0	500	1000	380	1000	1000
		6	0	500	1000	470	1000	1000
		7	0	500	1000	640	1000	1000
		8	0	300	1000	0	1000	1000
		9	0	500	1000	845	1000	1000
		10	0			780	1000	1000
		1	0	500	1000	775	1000	1000
	Empak, Inc.	1	0	1000		900	1500	1500
	General Aniline and Film Corp.	1	600	850	1500	757	1500	1500
		2	600	850	1500			
		3	600	850	1500	913	1500	1500
	Gilbraltar Wastewaters, Inc.	1		300				
	Malone Service Co.	1		1241				1500
		2		1074				
	Merichem co.	1		254		400	950	950
	Monsanto Chemical Co., Chocolate Bayou	4*						
		3		800				
		1						
		2		600				
	Monsanto Co.	1	0	746	1,023	746	2,000	1,500
		2	0	470		710	1,500	1,500
	Phillips Chemical Co.	D-2		14.3		0	600	600
		D-3	0	0	10	0	600	600
	Potash Co. of America Division	1	VAC	VAC	Vacuum	VAC	250	250
	Shell Chemical Co.	1	0	53.8	180			1000
		2	0	2023	200	0		1600
	SONICS INTERNATIONAL	1						
		2						
	Velsicol Chemical Co.	2			950	-		
		1		250				
		3			950			
	Vistron Corporation	1						
		2		560				
		3		860				
	Waste-water Inc.	1						
	Witco Chemical Co.,Houston	2		1298				
		1		1400				
	Witco Chemical Co.,Marshall	3		570				
		2			1,000			
WY	WYCON CHEMICAL COMPANY							

ENGINEERING DETAILS-RATE OF INJECTION,CLASSI HW

State	FACILITY NAME	WELL NO.	GPM	Min	Avg	Max	Actual	Design	Permit
AK	Arco Alaska Inc.	2*	84	0	84	336			
		1*	84	0	84	336			
AL	Stauffer Chemical Co.	3	70						
		1	70						
		2	70						
AR	Ethyl Corp.	1	16	25	30	100.35	28		
	Great Lakes Chemical Corp., Main plant	2	100	50	100	150	75		
	Great Lakes Chemical Corp., South plant	3X	469						
		4	474						
		5							
CA	Aerojet Strategic Propulsion Company	1	34.6	0	34.6	50	35	70	35
	Rio Bravo Disposal Facility	1	153		153	245			
CO	SHELL OIL COMPANY								
	U.S. CORP. OF ENGINEERS AND CHEMICAL CORP.								
FL	Kaiser Aluminum & Chemical Co.	1	300	149	300	387			
	Monsanto Company	3	1,200	1100	1250	1400			1200*
		1	1,200	1100	1250	1,400			1200*
		2	1,200	1100	1250	1,400			1200*
IL	Allied Chem. Co.	1	83	65	83	100	60	200	150
	Cabot Corp.	2	225	170	225	280			
		1	200					200	
	LTV Steel Company*	1	260	50	175	260	260		260
	Velsicol Corp.	1	200						
		2	100						
IN	Bethlehem Steel Corporation,Burn Harbor Plant	2*	131		131				
		1*	6						
	General Electric	2	60						
		1	28.5						
	Hoskins Manufacturing Co.	1	21						
	Indiana Farm Bureau Cooperative	IN3	7	2	7	15.3	5.5	none?	none?
	Inland Steel Company*	2	230			300			
		1	211			250	211	300	
	Midwest Steel	1*	75	0	53	75	62	NA	75
	Pfizer Mineral and Pigment Co.	1*	500		500				
		2*	500		500				
	Uniroyal Inc. *	1	80	50	80	110			
	United States Steel Corporation	IN9	300	0	184	300		300	0?
KS	Sherwin Williams	3	10.5		10.5				

ENGINEERING DETAILS-RATE OF INJECTION,CLASSI HW

State	FACILITY NAME	WELL NO.	GPM	Min	Avg	Max	Actual	Design	Permit
		2	10.5		10.5				
	Vulcan Materials Co.	4	300	0	208	350	208	400	300
		3	350	0	300	350	295	400	350
		7	350	0	300	350	325	400	350
		8	300	0	300	350	185	400	300
		9	350	0	350	400	328	400	350
KY	E.I. Dupont De Nemours & Co.	1	43	25	44.3	150	44.3	150	150
		2	100	25	95	150	95	150	150
LA	American Cyanamid Co.	1	300						
		2	300						
		3	200						
		4	250						
		5	300						
	Arcadian Corporation*	1	500		50		NONE	500	500
	Atlas Processing Co.	1	20						
	BASF Wyandotte Corporation	D-1	75	0	52	144	75	250	150
	Borden Chemical Co.	1	750	300	750	1,200			
		2	750	300	750	1,200			
		3	750	300	750	1,200			
	Browning-Ferris Industries (CECOS)	1	90	30	90	120	vary	120	120
	Chevron Chemical Co.	2	145	000	145	266	145	NA	NA
		3	120	000	120	220	120	NA	NA
	Citgo Petroleum Corp.*	1	~400		346	542	346	800	
		2	~85		123	440	123	600	
		4							
		3							
	E. I. Dupont,Laplace	7	190	20	190	540	200	400	NA
		6	on standby						
		5	on standby						N
		4	130	9	130	280	230	400	NA
		3	300	80	300	480	216	400	NA
		2	90	44	90	302	132	400	NA
		1	146	88	146	310	146	400	NA
	Ethyl Corp. of Baton Rouge	1	100	0	100	150	100	100	none
	Georgia-Pacific Corporation	1	0						
	International Minerals and Chemical Corp.	1	100	0	100	240	85	400	
		2	100	0	100	240	0	400	
	Monsanto Chemical Company,Luling plant	1	98		98				
		2	248		248				
	NASA, Michoud Assembly Facility*	2	57		57				
		1	57		57				
	Rollins Environmental Services of LA,Inc	1	285	270	285	450			
	Rubicon Chemical Inc.	1	106		106				
		2	~170						

ENGINEERING DETAILS-RATE OF INJECTION,CLASSI HW

State	FACILITY NAME	WELL NO.	GPM	Min	Avg	Max	Actual	Design	Permit
		3	260						
	Shell Chemical Company	4	87.5	60	87.5	115	87	84	
		5	50						
	Shell Oil Company, East site	4	110		105	200	110	350	
		5	175		175		175	400	
		6	200		200		200	400	
		7	290		290		290	450	
		8	255		255		280	600	
		9	280		280		255	530	
		2	170		170		170	300	
	Shell Oil Company, West site	8	110		110		110	400	
		2	60		60		60	210	
		5	345		345		345	360	
		6	60		60		60	195	
		9	200		200		200	400	
	Stauffer Chemical Company	2	80	80	85	110	75	110	
		1	85	80	85	110	90	110	
		3	85	80	85	110	80	600	400
	TENNECO OIL COMPANY	?							
		3	54		54	100	54	360	
		4	39		39	122	39	360	
	Texaco Inc.	5					0	300	
		4		76	108	186	108	300	
		2					0	200	
		1					0	200	
		6					0	300	
	Uniroyal Inc.	2	452		452		500		NA
		3	303		303		350		NA
		1	583		583		850		NA
	Universal Oil Products	7							
		6	148		148				
		5	211		211				
	Witco Chemical Corporation,Gretna	1	262	25	262		262	300	400
	Witco Chemical Corporation,Hahnville	1	164	42	164	220	200	220	N
		2	163	42	163	220	200	220	N
	Wyandotte Chemical Corporation	D-2							
MI	BASF Wyandotte	1	150					160	
		2	130				100	300	NA
		3	130			82	100	300	NA
	Detroit Coke Company	1	50		50	100			
		2	87						
		3	67						
	Dow Chem. Co.	5							
		2	40						
		4	21.5						

ENGINEERING DETAILS-RATE OF INJECTION,CLASSI HW

State	FACILITY NAME	WELL NO.	GPM	Min	Avg	Max	Actual	Design	Permit
		8	20						
	E.I. Dupont,Montaque	1	87						
	Ford Motor Co., Rouge Steel	D-1	18.7		18.7				
		D-2	16.2						
	Hoskins Manufacturing Co.	1	10.6						
	Parke Davis & Co.	2							
		1							
		3	45		45				
		4	45		45				
	The Upjohn Co.	2							
	Total Petroleum Inc.*	1	0	0	50	100		100	
		2	0		59		59	100	*
	Velsicol Chem. Corp.	2	156						
MS	Filtrol Corp.	1	250		250				
NC	HERCOFINA	OB 5	208						
		I6	208						
		17 A	208						
		OB 4					208		
OH	Armco Steel Corp.	1	43			43			
		2	36.4			36.4			
	Calhio Chemical Inc.*	1	56		56				
		2	50						
	Chemical Waste Management, Inc.	6						100	
		2		0	0	0		120	
		3	49	0	46	49	48	100	
		4	40	0	42	45	42	100	NA
		5	66	0				100	NA
		1A	40	0	40	48	38	60	
	Sohio Chemical Company, Vistron	1	400					400	
		2	400					400	
		3	400					400	
	United States Steel Corporation	1	81.6	3	40	86.5	88	67	NA
		2*	81.6	21	71	83	82		NA
OK	Agrico Chem. co.	1	600	240	480	650	480	700	vary
	American Airlines Inc.	2							
		1	450	150	360	450			
	Chemical Resources Inc.	1	75	45	75	90			
	Kaiser	1	305	0	98	150	98	250	250
		2	350	0	200	240	243	300	350
	Rockwell International	1	160	0	160	300			
	Somex	1	variable						
PA	Hammermill Paper Co.	3							

ENGINEERING DETAILS-RATE OF INJECTION,CLASSI HW

State	FACILITY NAME	WELL NO.	GPM	Min	Avg	Max	Actual	Design	Permit
		2	189		189				
		1	1,150						
TX	Amoco Oil Co.	5							
		4							
		3	210	0	147	1200	400*	750	2000
		2	12	0	105	500	250*	750	2000
		1	180	0		800	325*	550	2000
	Arco Chem. CO., Lyondale plant	3	400		400				
		2	69	0	69	212	72	350	350
		1	146	0	146	288	156	350	350
	Badische Corp. (Dow Badische Co.)	2	350					350	350
		1	57.9		57.9		150	350	350
	Browning - Ferris Industries	1							
	Celanese Chemical Co.	4	101		101				
		1	750		750				
		2	750		750				
		3	105		105				
	Celanese Chemical Co.,Clear Lake plant	1	286		286				400
		2							400
	Champlin, Soltex & ICI, Corpus Christi Petro	2	65	1		200	100	200	200
		1	64	1	64	200	100	200	200
	Chaparral Disposal Co. (BFI)*	1	59	0	59	67	59	67	180
	Chemical Waste Management	1	103		103				
	CHEMICAL WASTE MANAGEMENT, INC	1	200			200			200
		2							
	Cominco American Inc.	1							
	Disposal Systems, Inc.	1	31.3	0	31.3	260	40	300	260
	E. I. Dupont,Beaumount	2	450	0	425	600	520	600	600
		1	445	0	450	600	328	600	600
	E. I. Dupont,Houston plant	1	260		260				
		2	60		60				
		3	96		96				
	E. I. Dupont,Ingleside	3	150				23.9		150
		1	350			350			
		2	150			150	10.3		150
	E. I. Dupont,Sabine River works	9							
		10							550
		8							550
		7							
		6	9.8	0	8.5	23			
		ADN3	438		438	700			
		5	79	0	795	205			
		4	475		475	683			
	E. I. Dupont,Victoria	2	135	0	500	500	135	500	500
		3	100	0	100	500	95	500	500

ENGINEERING DETAILS-RATE OF INJECTION,CLASSI HW

State	FACILITY NAME	WELL NO.	GPM	Min	Avg	Max	Actual	Design	Permit
		4	100	0	100	500	140	500	500
		5	225	0	225	500	275	500	500
		6	225	0	225	500	260	500	500
		7	225	0	225	500	349	500	500
		8	100	0	100	500	100	500	500
		9		0	125	500	107	500	500
		10		0	240	500	350	500	500
		1	97	0	100	500	97	500	500
	Empak, Inc.	1	150	0	150		136	300	300
	General Aniline and Film Corp.	1		80	135	225	134	450	225
		2	225	80	135	225			
		3	160	80	135	225	213	450	225
	Gilbraltar Wastewaters, Inc.	1	82		82			200	
	Malone Service Co.	1	114		114				150
		2	158		158				
	Merichem co.	1	155	20	155	280	150	300	300
	Monsanto Chemical Co., Chocolate Bayou	4*	300					300	
		3	850		850			850	
		1	1,038					585	
		2	90		90			1,020	
	Monsanto Co.	1	425	0	425	1,150	688	1,000	600*
		2	330		330			1000	600*
	Phillips Chemical Co.	D-2	0		0			1,500	1,500
		D-3	180	0	76	200		1,500	
	Potash Co. of America Division	1		0	.29	37.9	37.9	100	30
	Shell Chemical Co.	1	53.4	0	53.4	150	53.4	200*	
		2	108	0	108	250	108		200*
	SONICS INTERNATIONAL	1							
		2							
	Velsicol Chemical Co.	2			100				
		1	~170		170				
		3	100		100				
	Vistron Corporation	1	50		50				
		2	138		138				
		3	162		162				
	Waste-water Inc.	1	100						
	Witco Chemical Co.,Houston	2	140		140				
		1	~12	0	12				
	Witco Chemical Co.,Marshall	3	26.9		26.9				
		2	11		11	30			
WY	WYCON CHEMICAL COMPANY								

ENGINEERING DETAILS-PACKER & ANNULUS INFO,CLASS I HW

State	FACILITY NAME	WELL NO.	PKR	DEPTH	Annulus fluid
AK	Arco Alaska Inc.	2*	y	1,960	Glycol & Water
		1*	y	1,960	Glycol & water
AL	Stauffer Chemical Co.	3	y	4,407	
		1		32	
		2	y	4,464	
AR	Ethyl Corp.	1	y	3,013	inhibited brine
	Great Lakes Chemical Corp., Main plant	2	y	2,668.4	inhibited brine
	Great Lakes Chemical Corp., South plant	3X	y	2,340	
		4	y	2,498.3	
		5	y	2,676.84	
CA	Aerojet Strategic Propulsion Company	1	y	976	2%KCl+Sodium bicarbonat
	Rio Bravo Disposal Facility	1	y	9,757	Nitrogen gas
CO	SHELL OIL COMPANY				
	U.S. CORP. OF ENGINEERS AND CHEMICAL CORP.				
FL	Kaiser Aluminum & Chemical Co.	1	y	3,916	water
	Monsanto Company	3	y	1,360	chromate brine solution
		1	y	1,370	Chromate brine solution
		2	y	1,395	Chromate brine solution
IL	Allied Chem. Co.	1	n		
	Cabot Corp.	2	y	4,651	
		1	n		
	LTV Steel Company*	1	n		water
	Velsicol Corp.	1	n		
		2	n		-
IN	Bethlehem Steel Corporation,Burn Harbor Plant	2*	y	2,508	lake water
		1*	y	2,185*	water
	General Electric	2	y	2,600	
		1	y		
	Hoskins Manufacturing Co.	1	y	3,366	inhibited. annulus fluid
	Indiana Farm Bureau Cooperative	IN3	y	2,248.65	water
	Inland Steel Company*	2	y	2,500	#2 diesel
		1	y	2,270	Biocide treated water*
	Midwest Steel	1*	y	2,078	water
	Pfizer Mineral and Pigment Co.	1*	n		#2 diesel oil
		2*	n		#2 diesel oil
	Uniroyal Inc. *	1			
	United States Steel Corporation	IN9	y	2,360	city water
KS	Sherwin Williams	3	y	1,420	

ENGINEERING DETAILS-PACKER & ANNULUS INFO,CLASS I HW

State	FACILITY NAME	WELL NO.	PKR	DEPTH	Annulus fluid
		2		~1,500	
	Vulcan Materials Co.	4	n		
		3	n		
		7	n		
		8	n		
		9	n		
KY	E.I. Dupont De Nemours & Co.	1	y	3,065	CaCl2 brine
		2	y	3,065	CaCl2 Brine
LA	American Cyanamid Co.	1	y	2,0465	
		2	y	2,896	
		3	y	2,950	
		4	y	2,337	
		5	y	2,222	
	Arcadian Corporation*	1	n		none
	Atlas Processing Co.	1	y	909	
	BASF Wyandotte Corporation	D-1	n		oil
	Borden Chemical Co.	1	y	3,000	
		2	y	2,900	
		3	y	3,123	
	Browning-Ferris Industries (CECOS)	1	y	4,340	inhibited brine
	Chevron Chemical Co.	2	y	2,665	water
		3	y	5,435	water
	Citgo Petroleum Corp.*	1	y	4,380	inhibited water
		2	y	4,686	inhibited water
		4			
		3			
	E. I. Dupont,Laplace	7	y	4,551	brine
		6	y	5,753	brine
		5	y	4,890	Brine
		4	y	4,571	
		3	y	4,138	brine
		2	y	2,373	brine
		1	y	2,458	brine
	Ethyl Corp. of Baton Rouge	1	y	8,925	brine
	Georgia-Pacific Corporation	1	y	3,254	water
	International Minerals and Chemical Corp.	1	y	3,741	
		2	y	3,729	water with inhibitor
	Monsanto Chemical Company,Luling plant	1	y	2,422	
		2	y	2,422	
	NASA, Michoud Assembly Facility*	2	y	4,856	
		1	y	4,856	
	Rollins Environmental Services of LA,Inc	1	y	4,446	inhibited brine
	Rubicon Chemical Inc.	1	y	3,302	brine
		2	y	3,422	

ENGINEERING DETAILS-PACKER & ANNULUS INFO,CLASS I HW

State	FACILITY NAME	WELL NO.	PKR	DEPTH	Annulus fluid
		3	y	5,209	brine
	Shell Chemical Company	4			
		5	y	2,243	
	Shell Oil Company, East site	4	y	1,729	inhibited brine
		5	y	1,962	inhibited brine
		6	y	2,787	inhibited water
		7	y	2,586	inhibited water
		8	y	2,691	inhibited water
		9	y	2,593	inhibited water
		2	y		
	Shell Oil Company, West site	8	y	2,570	water
		2	y	1,548	inhibited brine
		5	y	1,531	inhibited brine
		6	y	1,667	inhibited brine
		9	y	2,513	water
	Stauffer Chemical Company	2	y	3,632.19	water
		1	y	4,200	water
		3	y	4,222	brine/water
	TENNECO OIL COMPANY	?			
		3	y	2,600	Brine
		4	y	2,694	Brine
	Texaco Inc.	5	y	3,205	water
		4	y	3,582	water
		2	y	3,450	
		1	y	3,671	
		6	y	3,173	water
	Uniroyal Inc.	2	y	3,524	Baroid cote B 1,400
		3	y	4,509	Baroid cote B 1400
		1	y	2,959	AFC packer fluid 7790
	Universal Oil Products	7	y	~6,380	-
		6	y	980	
		5	y	989	fuel oil
	Witco Chemical Corporation, Gretna	1	y	6,765	
	Witco Chemical Corporation, Hahnville	1	y	1,438	water/KW-54
		2	y		water/kw-54
	Wyandotte Chemical Corporation	D-2			
MI	BASF Wyandotte	1			
		2	y	4,715	oil
		3	n		oil
	Detroit Coke Company	1	y	3,526	
		2			Fuel oil
		3	y	3,702	Fuel oil
	Dow Chem. Co.	5	y	3,660	
		2	y	3,682	
		4	y	4,865	

ENGINEERING DETAILS-PACKER & ANNULUS INFO,CLASS I HW

State	FACILITY NAME	WELL NO.	PKR	DEPTH	Annulus fluid
		8	y	4,822	
	E.I. Dupont,Montaque	1	n		
	Ford Motor Co., Rouge Steel	D-1	y	454	
		D-2	y	3,834	
	Hoskins Manufacturing Co.	1	y	2,588	Fresh Water
	Parke Davis & Co.	2	Y	1,584	
		1	y	1,430	
		3	y	4,973	
		4	y	4,982	
	The Upjohn Co.	2	y	1,254.3	
	Total Petroleum Inc.*	1	y	1,025	inhibited water
		2	y	3,272	inhibited water
	Velsicol Chem. Corp.	2	y	3,367	
MS	Filtrol Corp.	1	y		
NC	HERCOFINA	OB 5	YES	80	
		I6	YES	823	
		17 A	YES	120	
		OB 4	YES	80	
OH	Armco Steel Corp.	1	y	2,850	
		2	y		
	Calhio Chemical Inc.*	1	y	4,745	
		2	y	5,450	
	Chemical Waste Management, Inc.	6	*		
		2	y	2,785	Diesel
		3	n	*	Diesel
		4	n	*	Diesel
		5	y	2,790	Diesel
		1A	n	*	Diesel
	Sohio Chemical Company, Vistron	1	y	2,783	
		2	y	2,799	
		3			
	United States Steel Corporation	1	y	5,422	corrosion inhibited H2O
		2*	y	5,427	corrosion inhibited H2O
OK	Agrico Chem. co.	1	y	1,451	inhibited water
	American Airlines Inc.	2	y	1,760	
		1	y	1,750	
	Chemical Resources Inc.	1	y	2,046	crude oil
	Kaiser	1	y	331	H2O & sodium bichromate
		2	y	384	
	Rockwell International	1	y	1,782	water
	Somex	1	y	1,743	
PA	Hammermill Paper Co.	3			

ENGINEERING DETAILS-PACKER & ANNULUS INFO, CLASS I HW

State	FACILITY NAME	WELL NO.	PKR	DEPTH	Annulus fluid
		2	y	1,600	
		1	none		
TX	Amoco Oil Co.	5			
		4			
		3	y	5,801	inhibited brine
		2	y	6,590	inhibited brine
		1	y	6,372	inhibited brine
	Arco Chem. CO., Lyondale plant	3	y	6,256	
		2	y	6,340	inhibited brien
		1	y	6,304	inhibited brine
	Badische Corp. (Dow Badische Co.)	2	y	6,675	brine
		1	y	6,100	brine
	Browning - Ferris Industries	1			
	Celanese Chemical Co.	4	y	3,323	
		1	y	4,650	
		2	y	3,208	
		3	y	3,195	
	Celanese Chemical Co., Clear Lake plant	1	y	5,201	brine, corros. inhibitor
		2	y	5,200	brine, corros. inhibitor
	Champlin, Soltex & ICI, Corpus Christi Petro	2	y	7,128	brine*
		1	y	7,130	brine*
	Chaparral Disposal Co. (BFI)*	1	y	4,784	inhibited brine
	Chemical Waste Management	1	y	4,585	
	CHEMICAL WASTE MANAGEMENT, INC	1	YES	6709	
		2			
	Cominco American Inc.	1			
	Disposal Systems, Inc.	1	y	6,750	inhibited brine
	E. I. Dupont, Beaumount	2	y	4,180	10# brine
		1	y	4,078	10# brine
	E. I. Dupont, Houston plant	1	y	4,824	
		2	y	4,810	
		3	y	5,130	
	E. I. Dupont, Inglsside	3			water
		1	y	3,932	
		2	y	4,020	inhibited brine
	E. I. Dupont, Sabine River works	9	y		~4% sodium nitrite
		10	y	5,360	8.7#/g sodium nitrite
		8	y	4,048	4% sodium nitrite
		7			
		6	y	4,497	9#/g sodium chloride
		ADN3	y	4,271	~4% sodium nitrite
		5	y	4,448	~4% sodium nitrite
		4	y	4,467	~4% sodium nitrite
	E. I. Dupont, Victoria	2	y	3,800	brine
		3	y	3,251	brine

ENGINEERING DETAILS-PACKER & ANNULUS INFO,CLASS I HW

State	FACILITY NAME	WELL NO.	PKR	DEPTH	Annulus fluid
		4	y	3,064	brine
		5	y	3,020	$NaNO_2$ solution
		6	y	3,005	$NaNO_2$ solution
		7	y	3,014	$NaNO_2$ solution
		8	y	3,781	brine
		9	y	3,886	brine
		10	y	4,242	$NaNO_2$ solution
		1	y	3,166	brine
	Empak, Inc.	1	y	6,800	inhibited brine
	General Aniline and Film Corp.	1	y	3,290	inhibited brine
		2	y	3,750	brine
		3	y	3,343	brine
	Gilbraltar Wastewaters, Inc.	1			
	Malone Service Co.	1	y	4,872	
		2			
	Merichem co.	1	y	6,481	fresh water
	Monsanto Chemical Co., Chocolate Bayou	4*	y	5,985	
		3	y	5,970	
		1	y	3,525	
		2	y	4,002	inhibited brine
	Monsanto Co.	1	y	6,695	brine
		2	y	6,540	brine
	Phillips Chemical Co.	D-2	y	3,782	water
		D-3	y	3,748	water
	Potash Co. of America Division	1	n		Latex cement(solid)
	Shell Chemical Co.	1	y	6,800	brine
		2	y	6,755	brine
	SONICS INTERNATIONAL	1			
		2			
	Velsicol Chemical Co.	2			
		1	y	3,941	
		3	y	4,151	
	Vistron Corporation	1	y	5,100	
		2	y	7,244	
		3	n		
	Waste-water Inc.	1	y	6,700	
	Witco Chemical Co.,Houston	2	y	6,651	H_2O w. corrosion inhib*
		1	y	6,845	H_2O w. corrosion inhi*
	Witco Chemical Co.,Marshall	3	y	5,650	
		2	y	2,430	
WY	WYCON CHEMICAL COMPANY				

SECTION 3

Data on

> "The hydrogeological characteristics of the overlying and underlying strata, as well as that into which the waste is injected;"

INJECTION ZONE CHARACTERISTICS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	LITHOLOGY	Thknss	Name
AK	Arco Alaska Inc.	2*	sh,slt,ss	115	Tertiary Sagavanirktok
		1*	ss,sh,slt		Tertiary Sagavanirktok
AL	Stauffer Chemical Co.	3	ss,clay,marl	70	Naheola
		1	ss,cl,marls	75	Nanafalia
		2	ss,clay,marl	70	Naheola
AR	Ethyl Corp.	1	ss,sh,clay	85	Tokio
	Great Lakes Chemical Corp., Main plant	2	ss	55	Tokio,Blossom,Graves
	Great Lakes Chemical Corp., South plant	3X	ss	198	Graves,Meakins
		4	ss	100	Graves sand
		5	ss	~100	Graves sand
CA	Aerojet Strategic Propulsion Company	1	SS,Silt	700	Marine sediments
	Rio Bravo Disposal Facility	1	SS	801	Rio Bravo
CO	SHELL OIL COMPANY U.S. CORP. OF ENGINEERS AND CHEMICAL CORP.				
FL	Kaiser Aluminum & Chemical Co.	1	ls	976	Cedar Keys,Lawson
	Monsanto Company	3	ls	359	Lower Floridan
		1	ls	359	Lower Floridan
		2	ls	359	Lower Floridan
IL	Allied Chem. Co.	1	ss,dol.	308	Potosi
	Cabot Corp.	2	dol.	396	Potosi,Eminence
		1		413	Eminence,Potosi
	LTV Steel Company*	1	ss	1,760	Mt. Simon
	Velsicol Corp.	1	dol.	215	Salem
		2	ls	351	
IN	Bethlehem Steel Corporation,Burn Harbor Plant	2*	ss	1,755	Mt. Simon
		1*	SS	2,069	Eau Claire,Mt. Simon
	General Electric	2	ss	74	Bethel,Cypress
		1	ss	46	Bethel
	Hoskins Manufacturing Co.	1	ss	800	Mt. Simon
	Indiana Farm Bureau Cooperative	IN3	ss	62	Tar Springs
	Inland Steel Company*	2	ss	1,410	Mt. Simon
		1	ss	1,759	Mt. Simon
	Midwest Steel	1*	ss	1800	Mt. Simon
	Pfizer Mineral and Pigment Co.	1*	ss	2,338	Mt. Simon
		2*	ss	3,969	Mt. Simon
	Uniroyal Inc. *	1	ss	710	Mt. Simon
	United States Steel Corporation	IN9	ss	1,665	Mt. Simon
KS	Sherwin Williams	3	dol,ls,chert	1,004	Arbuckle group

INJECTION ZONE CHARACTERISTICS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	LITHOLOGY	Thknss	Name
		2	dol, ls, chert	500	Arbuckle group
	Vulcan Materials Co.	4	dol.	621	Arbuckle
		3	dol.	750	Arbuckle
		7	dol.	700	Arbuckle
		8	dol.	270	Arbuckle
		9	dol.	630	Arbuckle
KY	E.I. Dupont De Nemours & Co.	1	dol.	2,590	Knox
		2	dol.	2,590	Knox
LA	American Cyanamid Co.	1	ss, clay	122	Miocene age
		2	ss, clay, sh	225	Miocene age
		3	ss, clay	225	miocene age
		4	ss, clay	225	miocene age
		5	ss, clay	86	miocene age
	Arcadian Corporation*	1	ss	220	sedimentary
	Atlas Processing Co.	1	ss		Nacatoch
	BASF Wyandotte Corporation	D-1	ss	415	Frio
	Borden Chemical Co.	1	ss		Miocene
		2	ss		Miocene
		3	SS		Miocene
	Browning-Ferris Industries (CECOS)	1	ss	160	sand
	Chevron Chemical Co.	2	sand	unknown	unknown
		3	sand	unknown	unknown
	Citgo Petroleum Corp.*	1	ss	170	Jasper-Salaquifer
		2	ss	30	Jasper salaquifer
		4			
		3			
	E. I. Dupont, Laplace	7	ss	76	Upper Miocene
		6	ss	50	Miocene
		5	ss	200	Upper Miocene
		4	ss	200	Upper Miocene
		3	ss	200	Upper Miocene
		2	ss	160	pleistocene
		1	ss	75	pleistocene *
	Ethyl Corp. of Baton Rouge	1	ls	70	Het Line
	Georgia-Pacific Corporation	1	sh		
	International Minerals and Chemical Corp.	1	ss	50	Hosston
		2	ss	50	Hosston
	Monsanto Chemical Company, Luling plant	1	ss, silt, clay	90	
		2	ss, silt, clay		
	NASA, Michoud Assembly Facility*	2	ss	200	
		1	ss	200	
	Rollins Environmental Services of LA, Inc	1	sh, ss	280	Miocene
	Rubicon Chemical Inc.	1	ss, slt, sand	185	
		2	ss, slt, sand	185	

INJECTION ZONE CHARACTERISTICS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	LITHOLOGY	Thknss	Name
		3	sand	170	
	Shell Chemical Company	4	ss	82	sand
		5	SS	82	
	Shell Oil Company, East site	4	ss	213	Pliocene
		5	ss	121	Pliocene
		6	ss	190	Miocene
		7	ss	186	Miocene
		8	ss	100	Miocene
		9	ss	80	Miocene
		2	ss	150	
	Shell Oil Company, West site	8	ss	66	Miocene
		2	ss,sh	75	Pliocene
		5	ss,sh	70	Pliocene
		6	ss	200	Pliocene
		9	ss	62	Miocene
	Stauffer Chemical Company	2	ss	180	Fleming
		1	ss	130	Fleming
		3	ss	130	Fleming
	TENNECO OIL COMPANY	?			
		3	ss	~80	
		4	ss	~80	
	Texaco Inc.	5	ss	116	
		4	ss	180	
		2	ss	180	
		1	ss	130	
		6	ss	72	
	Uniroyal Inc.	2	ss	200	Miocene
		3	ss	200	Miocene
		1	ss	100	Miocene
	Universal Oil Products	7	ss,sh	2,000	Hosston
		6	ss	500	Nacatoch form.
		5	ss,clay	500	Nacatoch form.
	Witco Chemical Corporation,Gretna	1	ss	5,500	Miocene sand
	Witco Chemical Corporation,Hahnville	1	ss		
		2			
	Wyandotte Chemical Corporation	D-2			
MI	BASF Wyandotte	1			
		2	ss	1,180	Mt. Simone
		3	ss	1,260	Mt. Simon
	Detroit Coke Company	1	ss	436	Eau Claire, Mt. Simon
		2	ss	169	Eau Claire & Mt. Simon
		3	ss	468	Eau Claire & Mt. Simon

INJECTION ZONE CHARACTERISTICS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	LITHOLOGY	Thknss	Name
	Dow Chem. Co.	5	ls.		Dudee
		2	ls.	15	Dudee
		4	ss	108	Sylvania
		8	ss	62	Sylvania
	E.I. Dupont, Montaque	1	ss	400	Franconia, Galesville
	Ford Motor Co., Rouge Steel	D-1	ss	116	Sylvania
		D-2	ss	381	Aau Claire, Mt. Simon
	Hoskins Manufacturing Co.	1	ls	58	Dundee
	Parke Davis & Co.	2	ls.	297	Traverse
		1		209	
		3	ss	824	Mt. Simon
		4	ss	825	Mt. Simon
	The Upjohn Co.	2		203	Traverse, Detroit River
	Total Petroleum Inc.*	1	ss	214	Marshall
		2	ls, dol	195	Dudee
	Velsicol Chem. Corp.	2	ls, dol.	160	Dudee
MS	Filtrol Corp.	1	ss	1,212	Hosston
NC	HERCOFINA	OB 5	SAND, SILT, CL	200	TUSCALOOSA
		I6	SAND, SILT, CL	200	TUSCALOOSA (CREST. AGE)
		17 A	SAND, SILT, CL	200	TUSCALOOSA (CREST.)
		OB 4	SAND, SILT, CL	200	TUSCALOOSA
OH	Armco Steel Corp.	1	ss		Mt. Simon
		2	ss		Mt. Simon
	Calhio Chemical Inc.*	1	ss, dol.	226	Maynardville, Rome
		2	ss, dol.	226	Maynardville, Rome
	Chemical Waste Management, Inc.	6	ss	136	Mt. Simon
		2	ss	110	Mt. Simon
		3	ss	70	Mt. Simon
		4	ss	108	Mt. Simon
		5	ss	140	Mt. Simon
		1A	ss	110	Mt. Simon
	Sohio Chemical Company, Vistron	1	ss	352	Mt. Simon
		2	ss	343	Mt. Simon
		3	ss	368	Mt. Simon
	United States Steel Corporation	1	ss	53	Mt. Simon
		2*	ss	57	Mt. Simon
OK	Agrico Chem. co.	1	ls, chert	1,333	Arbuckle
	American Airlines Inc.	2	ls, ss, dol	1,307	Arbuckle
		1	ls, ss, dol	1,307	Arbuckle

INJECTION ZONE CHARACTERISTICS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	LITHOLOGY	Thknss	Name
	Chemical Resources Inc.	1	ls,sand	1,267	Arbuckle,Basal
	Kaiser	1	dol,ss	465	Arbuckle
		2	dol.,ss	444	Arbuckle
	Rockwell International	1	ss,dol,ls	1,298	Arbuckle
	Somex	1	ls,dol,chert	293	Arlbuckle
PA	Hammermill Paper Co.	3	ls	~70	Bass Island Form.
		2	ls	~70	Bass Island Form.
		1	ls	~70	Bass Island Form.
TX	Amoco Oil Co.	5			
		4			
		3	sand	~ 200	Miocene
		2	sand	~200	Miocene
		1	ss	200	Miocene
	Arco Chem. CO., Lyondale plant	3	sand,clays	335	Frio
		2	ss,sh	254	Frio
		1	ss	285	Frio,Anahuac
	Badische Corp.(Dow Badische Co.)	2	ss	450	Catahoula
		1	ss	300	
	Browning - Ferris Industries	1			Heterostegina
	Celanese Chemical Co.	4	ss	225	
		1	ss	235	Miocene
		2	ss	300	Miocene
		3	ss	200	
	Celanese Chemical Co.,Clear Lake plant	1	ss	800	Lower Miocene
		2	ss	800	
	Champlin, Soltex & ICI, Corpus Christi Petro	2	ss,clay	670	Jackson,Frio
		1	ss,clay	670	Jackson
	Chaparral Disposal Co.(BFI)*	1	dol.	850	San Andres
	Chemical Waste Management	1	ss	1,230	
	CHEMICAL WASTE MANAGEMENT,INC	1	SANDS	2300	CATAHOOLA
		2			
	Cominco American Inc.	1			
	Disposal Systems, Inc.	1	ss,sh	500	Basal Frio
	E. I. Dupont,Beaumount	2	ss	490	Oakville
		1	ss	~500	Ockville
	E. I. Dupont,Houston plant	1	ss	2,200	Frio
		2	ss	2,200	Frio
		3	ss	173	Frio
	E. I. Dupont,Ingleside	3	ss,sh,clay	1,205	Catahoula,Oakville
		1	ss,clay	153	Catahoula
		2	ss,clay,sh	10	Oakville
	E. I. Dupont,Sabine River works	9	ss	2,100	lower Miocene
		10	ss	68	Miocene
		8	ss	42	Miocene

INJECTION ZONE CHARACTERISTICS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	LITHOLOGY	Thknss	Name
		7			
		6	ss	700	
		ADN3	ss	700	lower ,miocene
		5	ss	700	
		4	ss	700	
	E. I. Dupont,Victoria	2	ss	400	Catahoula
		3	ss	430	Catahoula
		4	ss	392	Catahoula
		5	ss	396	Catahoula
		6	ss	386	Cathoula
		7	ss	397	Catahoula*
		8	ss	430	Catahoula
		9	ss	420	Catahoula
		10	ss	232	Greta
		1	ss,sh	441	Catahaula
	Empak, Inc.	1	sh,ss	700*	Basil Frio
	General Aniline and Film Corp.	1	ss	394	Miocene
		2	ss	410	Miocene
		3	ss	362	Miocene
	Gilbraltar Wastewaters, Inc.	1	ss		Woodbine
	Malone Service Co.	1	ss	1,000	
		2	ss	3,100	
	Merichem co.	1	ss	80	Frio
	Monsanto Chemical Co., Chocolate Bayou	4*	ss,clay,sh	195	
		3	ss,clay		
		1	ss,sh	4,400	Miocene
		2	ss,sh	800	Miocene
	Monsanto Co.	1	ss	491	Catahoula
		2	ss	447	Catahoula
	Phillips Chemical Co.	D-2	ss	1,235	Lower Granite Wash
		D-3	ss	1,225	Lower Granite Wash.
	Potash Co. of America Division	1	sand	155	Glorietta
	Shell Chemical Co.	1	ss,sh	850	Basal,Frio
		2	ss,sh	850	Basal,Frio
	SONICS INTERNATIONAL	1			
		2			
	Velsicol Chemical Co.	2	ss		Miocene
		1	ss	1,400	
		3	ss	910	
	Vistron Corporation	1	ss,sh	1,500	Middle Frio
		2	ss,sh	1,500	Middle Frio
		3	ss	684	Middle Frio
	Waste-water Inc.	1	ls	200	Anahuac
	Witco Chemical Co.,Houston	2	ss,sh	90	Frio
		1	ss,sh	1,945	Frio
	Witco Chemical Co.,Marshall	3	ls	316	Blossom

INJECTION ZONE CHARACTERISTICS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	LITHOLOGY	Thknss	Name
		2	ls,ss	50	Blossom
WY	WYCON CHEMICAL COMPANY				

CONFINING ZONE CHARACTERISTICS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	LITHOLOGY	C.Z. THKNSS	Name
AK	Arco Alaska Inc.	2*	ss	1,500	Permafrost
		1*	permafrost		
AL	Stauffer Chemical Co.	3	clay	150	
		1	clay	150	
		2	clay	150	
AR	Ethyl Corp.	1	marls,chalk	~800	Brownstown,Ozan
	Great Lakes Chemical Corp., Main plant	2	sh,marls	800	Saratoga,Annona
	Great Lakes Chemical Corp., South plant	3X	sh,marls	335	Saratoga,Annona
		4	sh,marls	335	Saratoga,Annona
		5	sh,marls	335	Saratoga,Annona
CA	Aerojet Strategic Propulsion Company	1	SS,Silt	500	Valley spring-Ione
	Rio Bravo Disposal Facility	1	sh,silt	900	Freeman-Jewett
CO	SHELL OIL COMPANY				
	U.S. CORP. OF ENGINEERS AND CHEMICAL CORP.				
FL	Kaiser Aluminum & Chemical Co.	1	dol,anhy	600	Cedar Keys
	Monsanto Company	3	clay	215 lower	Bucatunna
		1	clay	215 lower	Bucatunna
		2	clay	215 lower	Bucatunna
IL	Allied Chem. Co.	1	dol.	712 upper	Prarie du Chien*
	Cabot Corp.	2	sh	211	Maquikem
		1	sh	211	Maquoketa
	LTV Steel Company*	1	sh	398	Eau Claire
	Velsicol Corp.	1	sh,ls.	274	St. Genevieve
		2	sh	110	New abany
IN	Bethlehem Steel Corporation,Burn Harbor Plant	2*	sh	68	B-cap
		1*	Silt.	68	B-cap
	General Electric	2			
		1			
	Hoskins Manufacturing Co.	1	dol,sh,slt	387	Eau Claire & Granite
	Indiana Farm Bureau Cooperative	IN3	ss,sh	23 lower	Tar Springs,upper ly
	Inland Steel Company*	2		52.5	B-cap
		1	sh	200	
	Midwest Steel	1*	SS,SH	700 AVG *	Eau Claire
	Pfizer Mineral and Pigment Co.	1*	sh	68	Eau Claire
		2*	sh	250	Eau Claire
	Uniroyal Inc. *	1	sh	600	
	United States Steel Corporation	IN9	sh	400	Eau Claire
KS	Sherwin Williams	3	ls,sh,ss	1,273	

CONFINING ZONE CHARACTERISTICS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	LITHOLOGY	C.Z. THKNSS	Name
	Vulcan Materials Co.	2	ls,sh,ss	1,350	
		4	ls,sh,ss	3,800	
		3	ls,sh,ss	3,800	
		7	ls,sh,ss	3,800	Wellington to Simpson
		8	sh,ls,ss	3,800	
		9	ls,sh,ss	3,800	Wellington to Simpson
KY	E.I. Dupont De Nemours & Co.	1	dol,ls.	700	Trenton,Black R,Chazy
		2	dol,ls	700	Trenton/Black R/Chazy
LA	American Cyanamid Co.	1	sh,ss	1,360	Miocene age
		2	ss,sh	1,750	Miocene age
		3	sh,ss	1,750	miocene age
		4	clay	1,360	miocene age
		5	clay	1,900	miocene age
	Arcadian Corporation*	1	sh,clay	1100	sedimentary
	Atlas Processing Co.	1			
	BASF Wyandotte Corporation	D-1	sh	275	Miocene
	Borden Chemical Co.	1	sh		Miocene
		2	sh		Miocene
		3	sh		
	Browning-Ferris Industries (CECOS)	1	sh,clay	40-80	shale
	Chevron Chemical Co.	2	sh	40	unknown
		3	sh	40	unknown
	Citgo Petroleum Corp.*	1		200	Burkeville
		2		200	Burkeville
		4			
		3			
	E. I. Dupont,Laplace	7	sh	100	Upper Miocene
		6	sh	70	Miocene
		5	sh	120	Upper Miocene
		4	sh	100	Upper Miocene
		3	sh	100	Upper Miocene
		2	sh	40	pliocene
		1	sh	40	pliocene*
	Ethyl Corp. of Baton Rouge	1	sh		Anahuac Fm.
	Georgia-Pacific Corporation	1			
	International Minerals and Chemical Corp.	1	sh	320	Sligo
		2	sh	315	Sligo
	Monsanto Chemical Company,Luling plant	1	sh,ss,silt	~1,200	
		2	clay	*	
	NASA, Michoud Assembly Facility*	2	sh		
		1	sh		
	Rollins Environmental Services of LA,Inc	1	sh,ss	1080	Miocene
	Rubicon Chemical Inc.	1	sh,clay,slt	45*	
		2	sh,clay,slt	35*	

CONFINING ZONE CHARACTERISTICS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	LITHOLOGY	C.Z. THKNSS	Name
		3	sh,clay,slt	170*	
	Shell Chemical Company	4	sh,slt,clay	75	
		5	SH	200	
	Shell Oil Company, East site	4	ss,clay,slt	300	Pliocene
		5	ss,clay,slt	108	Pliocene
		6	silt,clay	48	Miocene
		7	slt,clay,sh	408	Miocene
		8	silt,clay	320	Miocene
		9	silt,clay	400+	Miocene
		2	ss,slt,clay	190*	
	Shell Oil Company, West site	8	slt,clay,sh	106	Miocene
		2	slt,clay,sh	95	Pliocene
		5	slt,clay,sh	120	Pliocene
		6	slt,clay,sh	140	Pliocene
		9	slt,clay,sh	365	Miocene
	Stauffer Chemical Company	2	silt,clay	190	Fleming
		1	silt,clay	390	Fleming
		3	silt,clay	390	Fleming
	TENNECO OIL COMPANY	?			
		3	sh	~70	*
		4	sh	~70	
	Texaco Inc.	5	sh	200	
		4	sh	200	
		2	sh	200	
		1	sh	200	
		6	sh	200	
	Uniroyal Inc.	2	clay,sh,slt	150	
		3	clay,silt	150	
		1	clay,slt,sh	200	Miocene
	Universal Oil Products	7	sh		
		6	sh		
		5	clay		
	Witco Chemical Corporation,Gretna	1	sh	600	
	Witco Chemical Corporation,Hahnville	1			
		2			
	Wyandotte Chemical Corporation	D-2			
MI	BASF Wyandotte	1			
		2	sh,dol	700	Prairie du Chien
		3	sh,dol	700	Prairie du Chien
	Detroit Coke Company	1	ss,ls,dol		
		2	sh,ls,dol		
		3	ls,dol,sh		
	Dow Chem. Co.	5			
		2	sh		Antrim,Sunbury
		4	sh		Antrim,Subury

CONFINING ZONE CHARACTERISTICS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	LITHOLOGY	C.Z. THKNSS	Name
		8			
	E.I. Dupont, Montaque	1			
	Ford Motor Co., Rouge Steel	D-1			
		D-2			
	Hoskins Manufacturing Co.	1			
	Parke Davis & Co.	2			
		1			
		3	sh		Antrim, Ellsworth*
		4	sh	~830	Ellsworth, Antrim*
	The Upjohn Co.	2			
	Total Petroleum Inc.*	1	ls, sh	400 upper	Bayport-Michigan
		2	sh	61 upper	Bell
	Velsicol Chem. Corp.	2	sh		Coldwater, Antrim
MS	Filtrol Corp.	1	sh	912	
NC	HERCOFINA	OB 5	CLAY, SILT	100	BLACK CREEK
		I6	CLAY, SILT	100(750-850	BLACK CREEK (CREST.AGE
		17 A	CLAY, SILT	100(750-850	BLACK CREEK
		OB 4	CLAY, SILT	100	BLACK CREEK
OH	Armco Steel Corp.	1			
		2			
	Calhio Chemical Inc.*	1	impermeable	75	
		2	impermeable	75	
	Chemical Waste Management, Inc.	6	dol	2,072	Rome
		2	dol	2,072	Rome
		3	dol	2,072	Rome
		4	dol	2,072	Rome
		5	dol	2,072	Rome
		1A	dol	2,072	Rome
	Sohio Chemical Company, Vistron	1	dol	400	Eau claire & Rochester
		2	dol	400	Eau claire & Rochester
		3	dol	400	Eau claire & Rochester
	United States Steel Corporation	1	sh, ls, dol.	1,260	Tomstown, Rome,
		2*	sh, ls, dol.	1,260	Tomstown, Rome,
OK	Agrico Chem. co.	1	sh	361	Woodford
	American Airlines Inc.	2	sh	40	
		1	sh	40	Woodford
	Chemical Resources Inc.	1	sh, ls	30	Chattanooga

CONFINING ZONE CHARACTERISTICS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	LITHOLOGY	C.Z. THKNSS	Name
	Kaiser	1	sh	57	Chattanooga
		2	sh	58	Chatanooga
	Rockwell International	1	sh	52	Chattanooga
	Somex	1	sh	24	Woodford
PA	Hammermill Paper Co.	3	sh, ls, chert	~395	
		2	ls, sh, chert	~395	
		1	ls, sh, chert	~395	
TX	Amoco Oil Co.	5			
		4			
		3	sh, clay	~1,200	Lissie and Miocene
		2	sh, clay	~1200	Lissie, Miocene
		1	sh	~1,200	Lissie, Miocene
	Arco Chem. CO., Lyondale plant	3	sh	410	Anahuac
		2	sh	370	Anahauc
		1	sh	400	Anahuac
	Badische Corp. (Dow Badische Co.)	2	sh	1,500	Montgomery, Betty
		1	sh, clay	1,500	Jasper, Beaumont
	Browning - Ferris Industries	1			
	Celanese Chemical Co.	4	clay	1,200	Beaumount
		1	clay	1,300	Beaumount
		2	clay	1,200	Beaumont
		3	clay	1,200	Beaumount
	Celanese Chemical Co., Clear Lake plant	1	sh	3,100	Pliocene, Miocene
		2	sh	3,100	Jasper
	Champlin, Soltex & ICI, Corpus Christi Petro	2	ss, sh, clay	1,500	
		1	sh, ss, clay	1,500	Anahauc
	Chaparral Disposal Co. (BFI)*	1	ls	3,400	Grayburg, Yates
	Chemical Waste Management	1	clay		
	CHEMICAL WASTE MANAGEMENT, INC	1	CLAY, SHALE	4000	
		2			
	Cominco American Inc.	1			
	Disposal Systems, Inc.	1	sh	600	Anahuac
	E. I. Dupont, Beaumount	2	sand, clay	2,470	Lagarto
		1	sand, clay	2,470	Lagarto
	E. I. Dupont, Houston plant	1	ss, sh	810	Frio, Anahauc
		2	ss, sh	810	Frio Anahauc
		3	ss, sh	810	Frio, Anahauc
	E. I. Dupont, Ingleside	3	ss, clay	99	Lagarto
		1	sh, ss	2,000	Oakville
		2	ss, clay	990	Lagarto
	E. I. Dupont, Sabine River works	9	sand, sh	810	Jasper, Anahauc
		10	ss, sh	810	Anahauc
		8	ss, sh	810	Anahauc
		7			

CONFINING ZONE CHARACTERISTICS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	LITHOLOGY	C.Z. THKNSS	Name
		6	ss,sh	810	Jasper,Anahauc
		ADN3	ss,sh	810	Jasper,Anahauc
		5	ss,sh	810	Jasper,Anahauc
		4	sand,sh	810	Jasper,Anahauc
	E. I. Dupont,Victoria	2	sh	1,900	Legarto
		3	sh	1,900	Legarto
		4	sh	1900	Lagarto
		5	sh	1,900	Lagarto,Anahuac
		6	sh,clay	1,900	Lagarto
		7	sh	1,900	Lagarto
		8	sh	1,900	Lagarto
		9	sh	1,900	Lagarto
		10	sh	1,900	Lagarto
		1	sh	1,900	Legarto
	Empak, Inc.	1	sh,ss	800	Anahauc,Burkeville
	General Aniline and Film Corp.	1	ss,sh	2,490	pliocene
		2	ss,sh	2,490	Pliocene
		3	ss,sh	2,490	Pliocene
	Gilbraltar Wastewaters, Inc.	1			
	Malone Service Co.	1	clay,sh,ss	1,300	Lissie
		2	clay,sh,ss	1,300	Lissie
	Merichem co.	1	sh	880	Anahauc
	Monsanto Chemical Co., Chocolate Bayou	4*	sh,clay,ss	3,400	
		3	ss,sh	1,363	
		1	ss,sh	700	
		2			
	Monsanto Co.	1	ss,sh	3,500	Jasper
		2	sh	3,500	Jasper
	Phillips Chemical Co.	D-2	ls	1,230	Arkosic Lime
		D-3	ls	1,245	Arkosic Lime
	Potash Co. of America Division	1	Gyp	285	Blaine
	Shell Chemical Co.	1	sh	560	Anahauc
		2	sh	560	Anahauc
	SONICS INTERNATIONAL	1			
		2			
	Velsicol Chemical Co.	2			
		1		500	Berkville
		3	sh,ss	425	Anahauc
	Vistron Corporation	1	sh	600	
		2	sh	600	Anahauc
		3	sh	600	Anahauc
	Waste-water Inc.	1	sh,ss	6,000	Fleming
	Witco Chemical Co.,Houston	2	sh	650	Anahuac
		1	sh	710	Frio,anahauc
	Witco Chemical Co.,Marshall	3	sh	280	Glenrose
		2	clay,ls,slt		Navarro

CONFINING ZONE CHARACTERISTICS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	LITHOLOGY	C.Z. THKNSS	Name
WY	WYCON CHEMICAL COMPANY				

SECTION 4

Data on

> "The location and size of all drinking water aquifers penetrated by the well, or within a one-mile radius of the well, or within two hundred feet below the well injection point;"

USDW #1 IN THE VICINITY OF CLASS I HW WELLS

FACILITY NAME	WELL NO.	USDW 1 NAME	DEPTH	THKNSS	TDS
Aerojet Strategic Propulsion Company	1	Laguna Fm.	130	500	200
Agrico Chem. co.	1	Verdigris Alluvium	30	10	*
Allied Chem. Co.	1	up. Pennsylvanian			1,000
American Airlines Inc.	2	Nowate	75	50	
	1	Nowate	25	50	
American Cyanamid Co.	1	Point Bar	<160		
	2	Point Bar	<160		
	3	Point Bar	<160		
	4	Point Bar	<160		
	5	Point Bar	<160		
Amoco Oil Co.	5				
	4				
	3	Chicot	1000	900	<3000
	2	Chicot	1000	900	<3000
	1	Chicot	1000	900	<3000
Arcadian Corporation*	1	Plaquemine aquifers	125	100	500
Arco Alaska Inc.	2*	none			
	1*	none			
Arco Chem. CO., Lyondale plant	3				
	1	Chicot	500	500	NA
	2	Chicot	500	500	NA
Armco Steel Corp.	1				
	2				
Atlas Processing Co.	1	Wilcox	300		
Badische Corp.(Dow Badische Co.)	2		1,300	1,000	<10,000
	1		1300	1000	<10000
BASF Wyandotte	1				
	2	none			
	3	none			
BASF Wyandotte Corporation	D-1				
Bethlehem Steel Corporation,Burn Harbor Plant	2*	Calumet	6	70	<1000
	1*	Calumet			
Borden Chemical Co.	1				
	2				
	3				
Browning - Ferris Industries	1				
Browning-Ferris Industries (CECOS)	1	Chicot	700	200	<10,000
Cabot Corp.	2				
	1				
Calhio Chemical Inc.*	1				
	2				
Celanese Chemical Co.	4				
	1				
	2				
	3				
Celanese Chemical Co.,Clear Lake plant	1				

USDW #1 IN THE VICINITY OF CLASS I HW WELLS

FACILITY NAME	WELL NO.	USDW 1 NAME	DEPTH	THKNSS	TDS
	2				
Champlin, Soltex & ICI, Corpus Christi Petro	1				
	2				
Chaparral Disposal Co. (BFI)*	1	Edwards-Trinity	110	110	(3000
Chemical Resources Inc.	1	Alluvium	32	32	(3000
Chemical Waste Management	1				
Chemical Waste Management, Inc.	1A	Big Lime	50	551	7000 MAX
	2	Big Lime	50	550	3000 MAX
	3	Big Lime	50	550	3000 MAX
	4	Big Lime	50	550	3,000 MAX
	5	Big Lime	50	550	3000 MAX
	6	Big Lime	50	550	3000 MAX
CHEMICAL WASTE MANAGEMENT, INC	1				
	2				
Chevron Chemical Co.	2	unknown			
	3	unknown			
Citgo Petroleum Corp.*	1	Chicot, upper	180	100	
	2	Chicot, upper	180	100	
	4				
	3				
Cominco American Inc.	1				
Detroit Coke Company	1	shallow aquifer	25		
	2				
	3				
Disposal Systems, Inc.	1	upper Chicot	300	200	900
Dow Chem. Co.	5				
	2				
	4				
	8				
E. I. Dupont, Beaumount	2	Lissie	400	690	)1100
	1	Lissie	400	590	)1100
E. I. Dupont, Houston plant	1				
	2				
	3				
E. I. Dupont, Ingleside	1				
	2	Beaumont clay	300	300	6,225*
	3	Beaumont clay	300	300	6,225*
E. I. Dupont, Laplace	7	Shallow Point Bar	70*	60	500
	6	Shallow point bar	70*	60	500
	5	shallow Point bar	70*	60	500
	4	shallow point bar	70*	60	500
	3	Shallow (Pt. BAr)	70*	60	500
	2	shallow	70*	60	500
	1	shallow (Pt. Bar)	70*	60	500
E. I. Dupont, Sabine River works	9				
	10	Alta-Loma	600	130	680

USDW #1 IN THE VICINITY OF CLASS I HW WELLS

FACILITY NAME	WELL NO.	USDW 1 NAME	DEPTH	THKNSS	TDS
	8	Alta-Loma	600	130	680
	7				
	6				
	ADN3	upper chicot			
	4				
	5				
E. I. Dupont,Victoria	2	Beaumont *	500 *	*	1,000
	3	Beaumont *	500 *	*	1,000
	4	Beaumont *	500 *	*	1,000
	5	Beaumont *	500	*	1,000
	6	Beaumont *	500	*	1,000
	7	Beaumont *	500 *	*	1,000*
	8	Beaumont *	500	*	1,000 *
	9	Beaumont *	500	*	1,000 *
	10	Beaumont *	500	*	1,000 *
	1	Beaumont *	500*	*	1,000*
E.I. Dupont De Nemours & Co.	1	Alluvium	113	113	400
	2	Alluvium	113	113	400
E.I. Dupont,Montaque	1				
Empak, Inc.	1	Upper Chicot *	150 *	150 *	1,700
Ethyl Corp.	1	Cockfield form.			
Ethyl Corp. of Baton Rouge	1	Plaquemine	600		3000
Filtrol Corp.	1	Moody's Branch	154	26	400
Ford Motor Co., Rouge Steel	D-1				
	D-2				
General Aniline and Film Corp.	1	Chicot	~380	1200	930
	2	Chicot	~ 380	1200	930
	3				
General Electric	2				
	1				
Georgia-Pacific Corporation	1				
Gilbraltar Wastewaters, Inc.	1				
Great Lakes Chemical Corp., Main plant	2	Alluvial deposits	0	85	
Great Lakes Chemical Corp., South plant	3X				
	4				
	5				
Hammermill Paper Co.	3				
	2				
	1				
HERCOFINA	I6	RECONT(UNCONFINED)		250	(150
	17 A	RECONT	0	50	(150
	OB 4	RECONT	0	50	(150
	OB 5	RECONT	0	50	(150
Hoskins Manufacturing Co.	1				
	1	Glacial Drit			
Indiana Farm Bureau Cooperative	IN3	NA			

USDW #1 IN THE VICINITY OF CLASS I HW WELLS

FACILITY NAME	WELL NO.	USDW 1 NAME	DEPTH	THKNSS	TDS
Inland Steel Company*	2	glacial drift	0	160	<1000
	1				
International Minerals and Chemical Corp.	1	Sparta	800	600	<10,000
	2	Sparta	800	600	<10,000
Kaiser	1				
	2				
Kaiser Aluminum & Chemical Co.	1	Ocala	370	320	unknwn
LTV Steel Company*	1	St. Peter ss.	1,474	118	
Malone Service Co.	1				
	2				
Merichem co.	1	Chicot	600	600	200
Midwest Steel	1*				
Monsanto Chemical Co., Chocolate Bayou	4*	Upper Chicot	300	200	
	1				
	2	Upper Chicot	surface	1,300	679
	3				
Monsanto Chemical Company,Luling plant	1				
	2				
Monsanto Co.	1	Chicot	1,100	1,000	3,000
	2	Upper Chicot	1,100	1,000	3,000
Monsanto Company	3	sand and gravel	440	440	10
	1	sand and gravel	440 .	440	10
	2	sand and gravel	440	440	10
NASA, Michoud Assembly Facility*	2				
	1.				
Parke Davis & Co.	2				
	1				
	3				
	4				
Pfizer Mineral and Pigment Co.	1*	Calumet		~40 avg	<1000
	2*	Calumet		40 avg	<1000
Phillips Chemical Co.	D-3	no aquifer			
	D-2	no aquifer			
Potash Co. of America Division	1	Ogallala	210	240	400
Rio Bravo Disposal Facility	1	Kern River	2,500	2,500	10,000
Rockwell International	1	Floodplain allluvium	0	varies	
Rollins Environmental Services of LA,Inc	1	Plaquemine	~800	~700	
Rubicon Chemical Inc.	1				
	2				
	3				
Shell Chemical Co.	1	Chicot	1,000	1,000	750*
	2	Chicot	1000	1000	750*
Shell Chemical Company	5				
	4				
SHELL OIL COMPANY					
Shell Oil Company, East site	2	Alluvium	160	160	<1,000

USDW #1 IN THE VICINITY OF CLASS I HW WELLS

FACILITY NAME	WELL NO.	USDW 1 NAME	DEPTH	THKNSS	TDS
	4	Alluvium	120	120	<250
	5	Alluvium	120	120	<1,000
	6	Alluvium	120	120	250
	7	Alluvium	120	120	250
	8	Alluvium	120	120	<250
	9	Alluvium	120	120	<250
Shell Oil Company, West site	8	Alluvium	120	120	<250
	2	Alluvium	120	120	<250
	5	Alluvium	120	120	<250
	6	Alluvium	120	120	<250
	9	Alluvium	120	120	<250
Sherwin Williams	2	Goffeyvalle	30	30	2,800
	3	Coffeyville	30	30	2,800
Sohio Chemical Company, Vistron	1				
	2				
	3				
Somex	1				
SONICS INTERNATIONAL	1				
	2				
Stauffer Chemical Co.	3	Alluvium	150	150+	39
	1	Alluvium	150	150	39
	2	Alluvium	150	150+	39
Stauffer Chemical Company	2	Plaquemine Gonzales	196	56	665
	1	Plaquemine-Gonzales	196	56	665
	3	Plaquemine-Gonzales	196	56	665
TENNECO OIL COMPANY	?				
	3	100' sand	40	shallow	<1,000
	4	100' sand	100	shallow	<1000
Texaco Inc.	5	Norco-Gramercy			
	4	Norco-Gramercy			
	2	Norco-Gramercy			
	1	Norco-Gramercy			
	6	Norco-Gramercy			
The Upjohn Co.	2				
Total Petroleum Inc.*	1	Saginaw formation	443	124	
	2				
U.S. CORP. OF ENGINEERS AND CHEMICAL CORP.					
Uniroyal Inc.	1	Gongales aquifer	750	375*	10,000
	2	Gongales aquifer	)50	375*	10,000
	3	Gongales aquifer	750	375*	10,000
Uniroyal Inc. *	1				
United States Steel Corporation	1	Ohio River Aquifer	26	48	292
	IN9	upper aquifer	664	76	
	2*	Ohio river aquifer	26	48	292
Universal Oil Products	6	Sparta			
	5	Sparta			

USDW #1 IN THE VICINITY OF CLASS I HW WELLS

FACILITY NAME	WELL NO.	USDW 1 NAME	DEPTH	THKNSS	TDS
	7	Sparta			
Velsicol Chem. Corp.	2				
Velsicol Chemical Co.	2				
	3				
	1				
Velsicol Corp.	1				
	2				
Vistron Corporation	1				
	2				
	3				
Vulcan Materials Co.	4	Alluvium/Terrace	20	~80	~300
	3	Alluvium/Terrace	26	80	~300
	7	Alluvium/Terrace	20	80	~300
	8	Alluvium/Terrace	20	80	~300
	9	Alluvium/Terrace	20	80	~300
Waste-water Inc.	1				
Witco Chemical Co., Houston	1				
	2				
Witco Chemical Co., Marshall	3				
	2				
Witco Chemical Corporation, Gretna	1	Sand I	200	100	253*
Witco Chemical Corporation, Hahnville	1				
	2				
Wyandotte Chemical Corporation	D-2				
WYCON CHEMICAL COMPANY					

USDW #2 IN THE VICINITY OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	USDW 2 NAME	DEPTH	THKNSS	TDS
AK	Arco Alaska Inc.	2*				
		1*				
AL	Stauffer Chemical Co.	3	Miocene,Pliocene	800	650	2,200
		1	Miocene,Pliocene	800	650+	2,200
		2	Miocene,pliocene	800	650	2,200
AR	Ethyl Corp.	1	Sparta sand	500	90	300
	Great Lakes Chemical Corp., Main plant	2	Cockfield form.	100	200 avg	150 avg
	Great Lakes Chemical Corp., South plant	3X				
		4				
		5				
CA	Aerojet Strategic Propulsion Company	1	Laguna Fm.	350	30	200
	Rio Bravo Disposal Facility	1				
CO	SHELL OIL COMPANY					
	U.S. CORP. OF ENGINEERS AND CHEMICAL CORP.					
FL	Kaiser Aluminum & Chemical Co.	1	Avon Park	690	570	base USDW
	Monsanto Company	3	Upper Floridan	1,150	220	700
		1	Upper Floridan	1,150	220	1,130
		2	Upper Floridan	1,150	220	1,130
IL	Allied Chem. Co.	1				
	Cabot Corp.	2				
		1				
	LTV Steel Company*	1				
	Velsicol Corp.	1				
		2				
IN	Bethlehem Steel Corporation,Burn Harbor Plant	2*	Valparaiso	80	70	
		1*	Valparasio			
	General Electric	2				
		1		2,760		
	Hoskins Manufacturing Co.	1				
	Indiana Farm Bureau Cooperative	IN3				
	Inland Steel Company*	2	Silvrian	160	500	(1000
		1				
	Midwest Steel	1*				
	Pfizer Mineral and Pigment Co.	1*	Valparaiso		45 avg	
		2*	Valparaiso		45 avg	
	Uniroyal Inc. *	1				
	United States Steel Corporation	IN9	middle aquifer	1,832	1,034	4,470
KS	Sherwin Williams	3				

USDW #2 IN THE VICINITY OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	USDW 2 NAME	DEPTH	THKNSS	TDS
		2				
	Vulcan Materials Co.	4				
		3				
		7				
		8				
		9				
KY	E.I. Dupont De Nemours & Co.	1	NA			
		2	NA			
LA	American Cyanamid Co.	1	Gramercy	210 avg*	100	
		2	Gramercy	210 avg*	100	
		3	Gramercy	210 avg*	100	
		4	Gramercy	210 avg*	100	
		5	Gramercy	210 avg*	100	250
	Arcadian Corporation*	1	plaquemine aquifers	300	300	800
	Atlas Processing Co.	1				
	BASF Wyandotte Corporation	D-1				
	Borden Chemical Co.	1				
		2				
		3				
	Browning-Ferris Industries (CECOS)	1	Evangeline	800	300	(10,000
	Chevron Chemical Co.	2				
		3				
	Citgo Petroleum Corp.*	1	Chicot, middle	400	180	
		2	Chicot, middle	400	180	
		4				
		3				
	E. I. Dupont, Laplace	7	Gramarcy-Norco	300*	200	750*
		6	Gramarcy-Norco	300* -	200	750*
		5	Gramary-Norco	300*	200	750*
		4	Gramarcy-Norco	300*	200	750*
		3	Gramercy-Norco	300*	200	750*
		2	Gamarey	300*	200	750*
		1	Gramercy-Norco	300*	200	750*
	Ethyl Corp. of Baton Rouge	1				
	Georgia-Pacific Corporation	1				
	International Minerals and Chemical Corp.	1				
		2				
	Monsanto Chemical Company, Luling plant	1				
		2				
	NASA, Michoud Assembly Facility*	2				
		1				
	Rollins Environmental Services of LA, Inc	1				
	Rubicon Chemical Inc.	1				
		2				

USDW #2 IN THE VICINITY OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	USDW 2 NAME	DEPTH	THKNSS	TDS
		3				
	Shell Chemical Company	4				
		5				
	Shell Oil Company, East site	4	Gramercy	160	140	250
		5	Gramercy	160	140	250
		6	Gramercy	160	140	250
		7	Gramercy	160	140	250
		8	Gramercy	160	140	250
		9	Gramercy	160	140	250
		2	Grameroy	260	100	(1,000
	Shell Oil Company, West site	8	Gramercy	160	140	250
		2	Gramercy	160	140	250
		5	Gramercy	160	140	250
		6	Gramercy	160	140	250
		9	Gramercy	160	140	250
	Stauffer Chemical Company	2	aquifer systems	230	80	615
		1	aquifer systems	230	80	615
		3	aquifer systems	230	80	615
	TENNECO OIL COMPANY	?				
		3	200' sand	200	shallow	2,000*
		4	200' sand		shallow	2,000*
	Texaco Inc.	5	Gonzales-New Orleans	450	300	658
		4	Gonzales-New Orleans	450	300	658
		2	Gonzales-New Orleans	450	300	658
		1	Gonzales-New Orleans	450	300	658
		6	Gonzales-New Orleans	450	300	658
	Uniroyal Inc.	2				
		3				
		1				
	Universal Oil Products	7	Wilcox	190		
		6	Wilcox	190		
		5	Wilcox	190		
	Witco Chemical Corporation, Gretna	1	Sand II	400	200	350*
	Witco Chemical Corporation, Hahnville	1				
		2				
	Wyandotte Chemical Corporation	D-2				
MI	BASF Wyandotte	1				
		2				
		3				
	Detroit Coke Company	1	deep aquifer	70		
		2				
		3				
	Dow Chem. Co.	5				
		2				
		4				

USDW #2 IN THE VICINITY OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	USDW 2 NAME	DEPTH	THKNSS	TDS
		8				
	E.I. Dupont,Montaque	1				
	Ford Motor Co., Rouge Steel	D-1				
		D-2				
	Hoskins Manufacturing Co.	1	Coldwater SH	448		
	Parke Davis & Co.	2				
		1				
		3				
		4				
	The Upjohn Co.	2				
	Total Petroleum Inc.*	1	sands (along pine river	25	15	
		2				
	Velsicol Chem. Corp.	2				
MS	Filtrol Corp.	1	Cookfield formation	180	208	300
NC	HERCOFINA	OB 5	PEE DEE&BLACK CREEK	50	800	(150)10000
		I6	PEE DEE & BLACK CREEK	50-850	800	(150)10000
		17 A	PEE DEE&BLACK CREEK	50	850	(150)10000
		OB 4	PEE DEE&BLACK CREEK	50	850	(150)10000
OH	Armco Steel Corp.	1				
		2				
	Calhio Chemical Inc.*	1				
		2				
	Chemical Waste Management, Inc.	6				
		2				
		3				
		4				
		5				
		1A				
	Sohio Chemical Company, Vistron	1				
		2				
		3				
	United States Steel Corporation	1				
		2*				
OK	Agrico Chem. co.	1	NA			
	American Airlines Inc.	2	Oologah	75	110	
		1	Oologah	75	110	
	Chemical Resources Inc.	1	Checkboard ls.	36	4	(3000
	Kaiser	1				
		2				

USDW #2 IN THE VICINITY OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	USDW 2 NAME	DEPTH	THKNSS	TDS
	Rockwell International	1	Hodenville Fm.	0	19	980
	Somex	1				1
PA	Hammermill Paper Co.	3				
		2				
		1				
TX	Amoco Oil Co.	5				
		4				
		3				
		2				
		1				
	Arco Chem. CO., Lyondale plant	3				
		2	Evangeline	1,870	1,350	340
		1	Evangeline	1,870	1370	340
	Badische Corp. (Dow Badische Co.)	2				
		1				
	Browning - Ferris Industries	1				
	Celanese Chemical Co.	4				
		1				
		2				
		3				
	Celanese Chemical Co., Clear Lake plant	1				
		2				
	Champlin, Soltex & ICI, Corpus Christi Petro	2				
		1				
	Chaparral Disposal Co. (BFI)*	1	Santa Rosa	1300	150	3000
	Chemical Waste Management	1				
	CHEMICAL WASTE MANAGEMENT, INC	1				
		2				
	Cominco American Inc.	1				
	Disposal Systems, Inc.	1	lower Chicot	800	500	340
	E. I. Dupont, Beaumount	2				
		1				
	E. I. Dupont, Houston plant	1				
		2				
		3				
	E. I. Dupont, Ingleside	3				
		1				
		2				
	E. I. Dupont, Sabine River works	9				
		10				
		8				
		7				
		6				
		ADN3	lower chicot			

USDW #2 IN THE VICINITY OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	USDW 2 NAME	DEPTH	THKNSS	TDS
		5				
		4				
	E. I. Dupont, Victoria	2	Lissie	500	350	580
		3	Lissie	500	350	580
		4	Lissie	500	350	5800
		5	Lissie	500	350	
		6	Lissie	500	350	580
		7	Lissie	500	350	580
		8	Lissie	500	350	580
		9	Lissie	500	350	
		10	Lissie	500	350	580
		1	Lissie	500	350	580
	Empak, Inc.	1	Lower Chicot	500	350	
	General Aniline and Film Corp.	1	Evangeline		2400	
		2	Evangeline		2400	
		3				
	Gilbraltar Wastewaters, Inc.	1				
	Malone Service Co.	1				
		2				
	Merichem co.	1	Evangeline	2,400	1,800	10,000
	Monsanto Chemical Co., Chocolate Bayou	4*	Lower Chicot	1,300	300	
		3				
		1				
		2	Lower Chicot			
	Monsanto Co.	1	Evangeline	1,560	460	10,000
		2	Evangeline	1,560	460	10,000
	Phillips Chemical Co.	D-2				
		D-3				
	Potash Co. of America Division	1				
	Shell Chemical Co.	1	Evangeline	2,700-	1,700	1,750*
		2	Evangeline	2700	1700	1,750*
	SONICS INTERNATIONAL	1				
		2				
	Velsicol Chemical Co.	2				
		1				
		3				
	Vistron Corporation	1				
		2				
		3				
	Waste-water Inc.	1				
	Witco Chemical Co.,Houston	2				
		1				
	Witco Chemical Co.,Marshall	3				
		2				
WY	WYCON CHEMICAL COMPANY					

USDW #3 IN THE VICINITY OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	UDSW 3 NAME	DEPTH	THKNSS	TDS
AK	Arco Alaska Inc.	2*				
		1*				
AL	Stauffer Chemical Co.	3				
		1				
		2				
AR	Ethyl Corp.	1	Cane river form.			
	Great Lakes Chemical Corp., Main plant	2	Sparta sand	600	300 avg	350 avg
	Great Lakes Chemical Corp., South plant	3X				
		4				
		5				
CA	Aerojet Strategic Propulsion Company	1				
	Rio Bravo Disposal Facility	1				
CO	SHELL OIL COMPANY					
	U.S. CORP. OF ENGINEERS AND CHEMICAL CORP.					
FL	Kaiser Aluminum & Chemical Co.	1	Lake city	1,260	650	unknown
	Monsanto Company	3	Lower Floridan	1,730	360	12,000
		1	Loer Floridan	1,730	360	12,800
		2	Lower Floridan	1,730	360	12,800
IL	Allied Chem. Co.	1				
	Cabot Corp.	2				
		1				
	LTV Steel Company*	1				
	Velsicol Corp.	1				
		2				
IN	Bethlehem Steel Corporation, Burn Harbor Plant	2*	Kankakee	50	40	
		1*	Kankakee			
	General Electric	2				
		1				
	Hoskins Manufacturing Co.	1				
	Indiana Farm Bureau Cooperative	IN3				
	Inland Steel Company*	2	St. Peter ss.	1,113	352	2000
		1				
	Midwest Steel	1*				
	Pfizer Mineral and Pigment Co.	1*	Kankakee		30 avg	
		2*	Kankakee		30 avg	
	Uniroyal Inc. *	1				
	United States Steel Corporation	IN9	bottom aquifer	4,278	1,906	
KS	Sherwin Williams	3				

USDW #3 IN THE VICINITY OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	UDSW 3 NAME	DEPTH	THKNSS	TDS
		2				
	Vulcan Materials Co.	4				
		3				
		7				
		8				
		9				
KY	E.I. Dupont De Nemours & Co.	1	NA			
		2	NA			
LA	American Cyanamid Co.	1	Norco	375 avg*	150	250
		2	Norco	375 avg*	150	250
		3	Norco	375 avg*	150	250
		4	Norco	375 avg*	150	250
		5	Norco	375 avg*	150	450
	Arcadian Corporation*	1	plaquemine aquifers	900	225	unknown
	Atlas Processing Co.	1				
	BASF Wyandotte Corporation	D-1				
	Borden Chemical Co.	1				
		2				
		3				
	Browning-Ferris Industries (CECOS)	1	Jasper			
	Chevron Chemical Co.	2				
		3				
	Citgo Petroleum Corp.*	1	Chicot, lower	640	220	
		2	Chicot, lower	640	220	
		4				
		3				
	E. I. Dupont, Laplace	7	Gonzales	700*	300	5,500*
		6	Gonzales	700* -	300	5,500*
		5	Gonzales	700*	300	5,500*
		4	Gonzales	700*	300	5,500*
		3	Gonzales	700*	300	5,500*
		2	Gonzales	700*	300	5,500*
		1	Gonzales	700*	300	5,500*
	Ethyl Corp. of Baton Rouge	1				
	Georgia-Pacific Corporation	1				
	International Minerals and Chemical Corp.	1				
		2				
	Monsanto Chemical Company, Luling plant	1				
		2				
	NASA, Michoud Assembly Facility*	2				
		1				
	Rollins Environmental Services of LA, Inc	1				
	Rubicon Chemical Inc.	1				
		2				

USDW #3 IN THE VICINITY OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	UDSW 3 NAME	DEPTH	THKNSS	TDS
		3				
	Shell Chemical Company	4				
		5				
	Shell Oil Company, East site	4	Norco	300	550	450
		5	Norco	300	550	450
		6	Norco	300	550	450
		7	Norco	300	550	450
		8	Norco	300	550	450
		9	Norco	300	550	1,750*
		2	Narco	450	150	1,750*
	Shell Oil Company, West site	8	Norco & Gonzales	300	550	450
		2	Norco & Gonzales	300	550	450
		5	Norco & Gonzales	300	550	250
		6	Norco & Gonzales	300	550	450
		9	Norco & Gonzales	300	550	450
	Stauffer Chemical Company	2		215	80	722
		1		215	80	722
		3		215	80	722
	TENNECO OIL COMPANY	?				
		3	400' sand	460	8*	6,500*
		4	400' sand		7*	6,500*
	Texaco Inc.	5				
		4				
		2				
		1				
		6				
	Uniroyal Inc.	2				
		3				
		1				
	Universal Oil Products	7				
		6				
		5				
	Witco Chemical Corporation, Gretna	1	Sand III	1,200	600	(10,000
	Witco Chemical Corporation, Hahnville	1				
		2				
	Wyandotte Chemical Corporation	D-2				
MI	BASF Wyandotte	1				
		2				
		3				
	Detroit Coke Company	1				
		2				
		3				
	Dow Chem. Co.	5				
		2				
		4				

USDW #3 IN THE VICINITY OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	UDSW 3 NAME	DEPTH	THKNSS	TDS
		8				
	E.I. Dupont,Montaque	1				
	Ford Motor Co., Rouge Steel	D-1				
		D-2				
	Hoskins Manufacturing Co.	1	Sunbury SH	1,366		
	Parke Davis & Co.	2				
		1				
		3				
		4				
	The Upjohn Co.	2				
	Total Petroleum Inc.*	1	glacial drift	105*	63	400
		2				
	Velsicol Chem. Corp.	2				
MS	Filtrol Corp.	1	Sparta sand	458	402	250-300
NC	HERCOFINA	OB 5				
		I6				
		17 A				
		OB 4				
OH	Armco Steel Corp.	1				
		2				
	Calhio Chemical Inc.*	1				
		2				
	Chemical Waste Management, Inc.	6				
		2				
		3				
		4				
		5				
		1A				
	Sohio Chemical Company, Vistron	1				
		2				
		3				
	United States Steel Corporation	1				
		2*				
OK	Agrico Chem. co.	1	NA			
	American Airlines Inc.	2	Labette	180	200	
		1	Labette	100	200	
	Chemical Resources Inc.	1	Cleveland sand	<90	<54	<10,000
	Kaiser	1				
		2				
	Rockwell International	1	Nowata shale	19	89	
	Somex	1				
PA	Hammermill Paper Co.	3				

USDW #3 IN THE VICINITY OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	UDSW 3 NAME	DEPTH	THKNSS	TDS
		2				
		1				
TX	Amoco Oil Co.	5				
		4				
		3				
		2				
		1				
	Arco Chem. CO., Lyondale plant	3				
		2	Jasper	12,800	250	NA
		1	Jasper	12,800	250	NA
	Badische Corp.(Dow Badische Co.)	2				
		1				
	Browning - Ferris Industries	1				
	Celanese Chemical Co.	4				
		1				
		2				
		3				
	Celanese Chemical Co.,Clear Lake plant	1				
		2				
	Champlin, Soltex & ICI, Corpus Christi Petro	2				
		1				
	Chaparral Disposal Co.(BFI)*	1				
	Chemical Waste Management	1				
	CHEMICAL WASTE MANAGEMENT,INC	1				
		2				
	Cominco American Inc.	1				
	Disposal Systems, Inc.	1	Evangeline	2,700	1900	700
	E. I. Dupont,Beaumount	2				
		1				
	E. I. Dupont,Houston plant	1				
		2				
		3				
	E. I. Dupont,Ingleside	3				
		1				
		2				
	E. I. Dupont,Sabine River works	9				
		10				
		8				
		7				
		6				
		ADN3				
		5				
		4				
	E. I. Dupont,Victoria	2	Goliad	850	250	680
		3	Goliad	850	250	680

USDW #3 IN THE VICINITY OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	UDSW 3 NAME	DEPTH	THKNSS	TDS
		4	Goliad	850	250	680
		5	Goliad	850	250	600
		6	Goliad	850	250	680
		7	Goliad	850	25020	680
		8	Goliad	850	250	600
		9	Goliad	850	250	680
		10	Goliad	850	250	680
		1	Goliad	850	250	680
	Empak, Inc.	1	Evangeline	2,650	2,150	1,500
	General Aniline and Film Corp.	1				
		2				
		3				
	Gilbraltar Wastewaters, Inc.	1				
	Malone Service Co.	1				
		2				
	Merichem co.	1				
	Monsanto Chemical Co., Chocolate Bayou	4*				
		3				
		1				
		2				
	Monsanto Co.	1				
		2				
	Phillips Chemical Co.	D-2				
		D-3				
	Potash Co. of America Division	1				
	Shell Chemical Co.	1				
		2				
	SONICS INTERNATIONAL	1				
		2				
	Velsicol Chemical Co.	2				
		1				
		3				
	Vistron Corporation	1				
		2				
		3				
	Waste-water Inc.	1				
	Witco Chemical Co.,Houston	2				
		1				
	Witco Chemical Co.,Marshall	3				
		2				
WY	WYCON CHEMICAL COMPANY					

SECTION 5

Data on

> "The location, capacity, and population served by each well providing drinking or irrigation water which is within a five-mile radius of the injection well;"

GROUND-WATER USAGE IN A 5 MILE RADIUS OF INJ.WELL

State	FACILITY NAME	WELL NO.	NO.	# OF PUWW	# OF PRWW	G W USE	% Public	POP
AK	Arco Alaska Inc.	2*	0	0	0	none		
		1*	0	0	0	0	0	0
AL	Stauffer Chemical Co.	3	30	6	24			
		1	30	6	24			
		2	30	6	24			
AR	Ethyl Corp.	1	9	0	9	109,200*		
	Great Lakes Chemical Corp., Main plant	2	47	3	44	*		
	Great Lakes Chemical Corp., South plant	3X						
		4						
		5						
CA	Aerojet Strategic Propulsion Company	1	2					
	Rio Bravo Disposal Facility	1	2 one mile radius		2			
CO	SHELL OIL COMPANY							
	U.S. CORP. OF ENGINEERS AND CHEMICAL CORP.							
FL	Kaiser Aluminum & Chemical Co.	1	2,764	64	2,700			
	Monsanto Company	3	none in injection zone					
		1	none in injection zone					
		2	none in injection zone					
IL	Allied Chem. Co.	1						
	Cabot Corp.	2						
		1						
	LTV Steel Company*	1						
	Velsicol Corp.	1						
		2						
IN	Bethlehem Steel Corporation, Burn Harbor Plant	2*	12					
		1*	12					
	General Electric	2						
		1						
	Hoskins Manufacturing Co.	1	7					
	Indiana Farm Bureau Cooperative	IN3						
	Inland Steel Company*	2	28					
		1	28					
	Midwest Steel	1*						
	Pfizer Mineral and Pigment Co.	1*						
		2*						
	Uniroyal Inc. *	1						
	United States Steel Corporation	IN9	none*	none	none			
KS	Sherwin Williams	3						

GROUND-WATER USAGE IN A 5 MILE RADIUS OF INJ.WELL

State	FACILITY NAME	WELL NO.	NO.	# OF PUWW	# OF PRWW	G W USE	% Public	POP
		2						
	Vulcan Materials Co.	4						
		3						
		7						
		8						
		9						
KY	E.I. Dupont De Nemours & Co.	1	215					
		2	215					
LA	American Cyanamid Co.	1	9					
		2	9					
		3	9					
		4	9					
		5	9					
	Arcadian Corporation*	1	78					
	Atlas Processing Co.	1	23					
	BASF Wyandotte Corporation	D-1	78	6		100,000	100	1000
	Borden Chemical Co.	1	78					
		2	78					
		3	78					
	Browning-Ferris Industries (CECOS)	1	41					
	Chevron Chemical Co.	2	6					
		3	6					
	Citgo Petroleum Corp.*	1	57					
		2	57					
		4						
		3						
	E. I. Dupont,Laplace	7	24 within two miles	1	23	1.7 mgd	100	10000
		6	24 within two miles	1	23	1.7 mgd	100	10000
		5	24 within two miles	1	24	1.7 mgd	100	10000
		4	24 within two miles	1	23	1.7 mgd	100	10000
		3	24 within two miles	1	23	1.7 mgd	100	10000
		2	24 within two miles	1	23	1.7 mgd	100	10,000
		1	24 in two miles	1	23	1.7 mgd	100	10000+
	Ethyl Corp. of Baton Rouge	1	24	5				
	Georgia-Pacific Corporation	1	46					
	International Minerals and Chemical Corp.	1	16					
		2	16					
	Monsanto Chemical Company,Luling plant	1	9					
		2	9					
	NASA, Michoud Assembly Facility*	2	7					
		1	7					

GROUND-WATER USAGE IN A 5 MILE RADIUS OF INJ.WELL

State	FACILITY NAME	WELL NO.	NO.	# OF PUWW	# OF PRWW	G W USE	% Public	POP
	Rollins Environmental Services of LA, Inc	1	11+	0	11			
	Rubicon Chemical Inc.	1	78					
		2	78					
		3	78					
	Shell Chemical Company	4	78					
		5	78					
	Shell Oil Company, East site	4	14*					
		5	14*	0	14 in use			
		6	14*	0	14 in use			
		7	14	0	14 in use			
		8	14	0	14 in use			
		9	14*	0	14 in use			
		2						
	Shell Oil Company, West site	8	14*	0	14 in use			
		2	14*	0	14 in use			
		5	14*	0	14 in use			
		6	14*	0	14 in use			
		9	14*	0	14 in use			
	Stauffer Chemical Company	2	33					
		1	33					
		3	33					
	TENNECO OIL COMPANY	?						
		3	15					
		4	15					
	Texaco Inc.	5	38					
		4	38					
		2	38					
		1	38					
		6	38					
	Uniroyal Inc.	2						
		3	78					
		1	78					
	Universal Oil Products	7	10					
		6	10					
		5	10					
	Witco Chemical Corporation, Gretna	1	16 co. reported 0					
	Witco Chemical Corporation, Hahnville	1	16					
		2	16					
	Wyandotte Chemical Corporation	D-2						
MI	BASF Wyandotte	1						
		2	none	none	none	none		
		3	none	none	none	none		
	Detroit Coke Company	1	7					
		2	7					
		3	7					

GROUND-WATER USAGE IN A 5 MILE RADIUS OF INJ.WELL

State	FACILITY NAME	WELL NO.	NO.	# OF PUWW	# OF PRWW	G W USE	% Public	POP
	Dow Chem. Co.	5						
		2						
		4						
		8						
	E.I. Dupont,Montaque	1						
	Ford Motor Co., Rouge Steel	D-1						
		D-2						
	Hoskins Manufacturing Co.	1						
	Parke Davis & Co.	2						
		1						
		3						
		4						
	The Upjohn Co.	2						
	Total Petroleum Inc.*	1						
		2						
	Velsicol Chem. Corp.	2						
MS	Filtrol Corp.	1						
NC	HERCOFINA	OB 5	<150	0	<150			
		I6	<150	0	<150			
		17 A	<150	0	<150			
		OB 4	<150	0	<150			
OH	Armco Steel Corp.	1						
		2						
	Calhio Chemical Inc.*	1						
		2						
	Chemical Waste Management, Inc.	6						
		2						
		3						
		4						
		5						
		1A						
	Sohio Chemical Company, Vistron	1						
		2						
		3						
	United States Steel Corporation	1						
		2*						
OK	Agrico Chem. co.	1						
	American Airlines Inc.	2	4		4			
		1	4		4			
	Chemical Resources Inc.	1	3*					
	Kaiser	1	6					
		2	6					
	Rockwell International	1	4	0			0	

GROUND-WATER USAGE IN A 5 MILE RADIUS OF INJ.WELL

State	FACILITY NAME	WELL NO.	NO.	# OF PUWW	# OF PRWW	G W USE	% Public	POP
	Somex	1						
PA	Hammermill Paper Co.	3						
		2						
		1						
TX	Amoco Oil Co.	5						
		4						
		3	138	24	114			
		2	138	24	114			
		1	138	24	114			
	Arco Chem. CO., Lyondale plant	3	142	2	140			
		2	142	2	140			
		1	142	2	140			
	Badische Corp. (Dow Badische Co.)	2	182	14	168			
		1	182	14	168			
	Browning - Ferris Industries	1						
	Celanese Chemical Co.	4	53	6	47			
		1	53	6	47			
		2	53	6	47			
		3	53	6	47			
	Celanese Chemical Co., Clear Lake plant	1	132	12	120			
		2	132	12	120			
	Champlin, Soltex & ICI, Corpus Christi Petro	2	37		37			
		1	37		37			
	Chaparral Disposal Co. (BFI)*	1	126	10	116			
	Chemical Waste Management	1	17		17			
	CHEMICAL WASTE MANAGEMENT, INC	1	)=8					
		2						
	Cominco American Inc.	1						
	Disposal Systems, Inc.	1	155	5	150			
	E. I. Dupont, Beaumount	2	26		26			
		1	26		26			
	E. I. Dupont, Houston plant	1	151	11	140			
		2	151	11	140			
		3	151	11	140			
	E. I. Dupont, Ingleside	3	81	6	75			
		1	81	6	75			
		2	81	6	75			
	E. I. Dupont, Sabine River works	9	150	23	127			
		10	150	23	127			
		8	150	23	127			
		7						
		6	150	23	127			
		ADN3	150	23	127			
		5	150	23	127			

GROUND-WATER USAGE IN A 5 MILE RADIUS OF INJ.WELL

State	FACILITY NAME	WELL NO.	NO.	# OF PUWW	# OF PRWW	G W USE	% Public	POP
		4	150	23	127			
	E. I. Dupont,Victoria	2	85					
		3	85					
		4	85					
		5	85					
		6	85					
		7	85					
		8	85					
		9	85					
		10	85					
		1						
	Empak, Inc.	1						
	General Aniline and Film Corp.	1	110	21	89			
		2	110	21	89			
		3	110	21	89			
	Gilbraltar Wastewaters, Inc.	1	113	4	109			
	Malone Service Co.	1	137	23	114			
		2	117	3	114			
	Merichem co.	1	143	3	140			
	Monsanto Chemical Co., Chocolate Bayou	4*	81	6	75			
		3	81	6	75			
		1	81	6	75			
		2	81	6	75			
	Monsanto Co.	1	127	13	114			
		2	127	13	114			
	Phillips Chemical Co.	D-2	740 (Co. reported only 4)	3	70			
		D-3	73 (co. reported 4)	3	70			
	Potash Co. of America Division	1						
	Shell Chemical Co.	1	135	5	130			
		2	135	5	130			
	SONICS INTERNATIONAL	1						
		2						
	Velsicol Chemical Co.	2	26		26			
		1	26		26			
		3	26		26			
	Vistron Corporation	1	36		36			
		2	36		36			
		3	36		36			
	Waste-water Inc.	1	54	2	52			
	Witco Chemical Co.,Houston	2	126	6	120			
		1	126	6	120			
	Witco Chemical Co.,Marshall	3	97	5	92			
		2	97	5	92			
WY	WYCON CHEMICAL COMPANY							

SECTION 6

Data on

> "The nature and volume of the waste injected during the one-year period immediately preceding the date of the report:"

NATURE AND VOLUME INJECTED BY CLASS I HW WELLS IN 1983

State	FACILITY NAME	WELL NO.	VOL(GAL)	WASTE TYPE
AK	Arco Alaska Inc.	2*	0	organic
		1*	8,048,250 g	organic
AL	Stauffer Chemical Co.	3	not yet injected	organics, brine
		1	36,792,000 g	brine, organic
		2	14,681,408 g	organics, brine
AR	Ethyl Corp.	1	6,645,000 g	E.P. toxic, corrosive waste
	Great Lakes Chemical Corp., Main plant	2	734,436 g	organic, acid
	Great Lakes Chemical Corp., South plant	3X		organic, acid
		4		organics, acid
		5		organic, acid
CA	Aerojet Strategic Propulsion Company	1	1,330,390 g*	Inorganics
	Rio Bravo Disposal Facility	1	*	organic, inorganic, brine, acid
CO	SHELL OIL COMPANY			
	U.S. CORP. OF ENGINEERS AND CHEMICAL CORP.			
FL	Kaiser Aluminum & Chemical Co.	1	53,000,000 g	acid, brine
	Monsanto Company	3	234,400,000 g*	process wastewater, contaminated stormwater, dilute acid*
		1	234,400,000 g*	process wastewater, contaminated stormwater, dilute acid*
		2	234,400,000 g*	process wastewater, contaminated stormwater, dilute acid*
IL	Allied Chem. Co.	1	20,314,740 g*	acid, organic
	Cabot Corp.	2	0 g	acid, silica compounds
		1	60,000,000 g	acid, silicon compounds
	LTV Steel Company*	1	5,800,000 g*	acids
	Velsicol Corp.	1		inorganics
		2		inorganics
IN	Bethlehem Steel Corporation, Burn Harbor Plant	2*		organic, inorganic, acids, brine
	Bethlehem Steel Corporation, Burn Harbor Plant	1*	4,000,000 g*	Inorganic, Organic, acid, brine, metal
	General Electric	2		brine, organics

NATURE AND VOLUME INJECTED BY CLASS I HW WELLS IN 1983

State	FACILITY NAME	WELL NO.	VOL(GAL)	WASTE TYPE
		1		organics
	Hoskins Manufacturing Co.	1	10,920,000 g	organic
	Indiana Farm Bureau Cooperative	IN3	56,600 g*	spent caustic and acidic wastes
	Inland Steel Company*	2	83,720 g	Inorganic,brine,acid
		1	89,827,939 g	Inorganics,acids,brine,water
	Midwest Steel	1*	25,113,000 g*	acid,brine,water,metal
	Pfizer Mineral and Pigment Co.	1*	26,208,000 g	organic
		2*	26,208,000 g	organic
	Uniroyal Inc. *	1		brine,organics,acid
	United States Steel Corporation	IN9	6,191,000 g*	acid,brine,water
KS	Sherwin Williams	3		metals,brine
		2		metals,brine
	Vulcan Materials Co.	4	109,600,000 g*	organics,inorganics
		3	141,900,000 g*	organics,inorganics
		7	151,800,000 g*	organics,inorganics
		8	85,400,000 g*	organics,inorganics
		9	9,000,000 g*	organic,inorganic
KY	E.I. Dupont De Nemours & Co.	1	23,300,000 g*	acid
		2	50,000,000 g*	acid
LA	American Cyanamid Co.	1	48,000,000 g*	acid,organic
		2	55,000,000 g*	organic,acid
		3	98,000,000 g*	acid,organic
		4	90,000,000 g*	acid,organic
		5	71,000,000 g*	acid,organic
	Arcadian Corporation*	1	0 g	acid
	Atlas Processing Co.	1		brine,acid,organic
	BASF Wyandotte Corporation	D-1	5,564,286 g*	acid
	Borden Chemical Co.	1		organic,acid
		2		organic,acid
		3		acid,organic
	Browning-Ferris Industries (CECOS)	1	36,000,000 g*	organic,metals,brine
	Chevron Chemical Co.	2	17,766,500 g*	organics,acid,water
		3	73,788,900 g*	water,organics,acid
	Citgo Petroleum Corp.*	1	192,855,600 g*	organic,brine,acid
		2	44,662,800 g*	acid,organic,brine
		4		
		3		
	E. I. Dupont,Laplace	7	54,600,000 g*	organic,brine
		6		organic,brine
		5	0 g	organic,brine
		4	58,800,000 g*	organic,brine,inorganics
		3	37,800,000 g*	organic,brine,inorganics
		2	4,200,000 g*	organic,brine,inorganic

NATURE AND VOLUME INJECTED BY CLASS I HW WELLS IN 1983

State	FACILITY NAME	WELL NO.	VOL(GAL)	WASTE TYPE
		1	54,600,000 g est*	brine,organics
	Ethyl Corp. of Baton Rouge	1	161,000 g	acid,organics
	Georgia-Pacific Corporation	1	0 g	organic,acid,brine,inorganic,caustic
	International Minerals and Chemical Corp .	1	5,376,000 g*	organic,acid,water
	International Minerals and Chemical Corp .	2	67,941,788 g*	oragnic,acid
	Monsanto Chemical Company,Luling plant	1		organic,acid,brine,herbicides
		2		organic,acid,brine,herbicides
	NASA, Michoud Assembly Facility*	2		metal,,acid,alkaline
		1		metal,,acid,alkaline
	Rollins Environmental Services of LA,Inc	1	54,000,000 g	organics,brine,alkaline
	Rubicon Chemical Inc.	1	60,900,000 g*	organic
		2	68,880,000 g*	organic
		3	35,700,000 g *	organic
	Shell Chemical Company	4	0 g	organic,brine,acid,heavy metals
		5		organic,acid,brine,heavy metals
	Shell Oil Company, East site	4	50,000,000 g*	organic
		5	85,800,000 g*	organic
		6	82,900,000 g*	organic
		7	135,400,000 g*	organic
		8	141,400,000 g*	organic
		9	133,800,000 g*	organic
		2		organic
	Shell Oil Company, West site	8	4,200,000 g*	organic,acid
		2	14,500,000 g	organics,water
		5	74,700,000 g*	organics,water
		6	31,300,000 g*	organic,acid
		9	86,600,000 g*	organic,acid
	Stauffer Chemical Company	2	13,800,000 g*	brine*
		1	0 g*	brine*
		3	0 g*	brine
	TENNECO OIL COMPANY	?		
		3	28,000,000 g*	organic,brine
		4	18,000,000 g*	brine,organic
	Texaco Inc.	5	7,588,812 g*	acid,organic
		4	45,074,946 g*	acid,organic
		2	92,148 g*	organic,acid
		1	59,212,020 g*	acid,brine,organic
		6	43,773,072 g*	acid,organic
	Uniroyal Inc.	2	171,600,000 g*	organic,acid,brine
		3	55,840,000 g*	organic,acid,brine
		1	36,800,000 g*	organic,acid,brine

NATURE AND VOLUME INJECTED BY CLASS I HW WELLS IN 1983

State	FACILITY NAME	WELL NO.	VOL(GAL)	WASTE TYPE
	Universal Oil Products	7		
		6		acid,brine,metal,silicon
		5		acid,metal,brine,silicon
	Witco Chemical Corporation,Gretna	1	78,652,140 g*	organic,brine,acid
	Witco Chemical Corporation,Hahnville	1	86,520,000 g*	metal,acid,organic
		2	76,356,000 g*	metal,acid,organic
	Wyandotte Chemical Corporation	D-2		
MI	BASF Wyandotte	1	0	
		2	6,400,000 g*	
		3	8,870,000 g*	brine,organics,metals
	Detroit Coke Company	1	26,208,000 g	organic
		2	64,439,000 g*	organic
		3	46,383,000 g*	organic
	Dow Chem. Co.	5		organics,pesticides,brine
		2		organic,pesticides,metals
		4		organics,pesticides,brine
		8		organics,pesticides,brine
	E.I. Dupont,Montaque	1		organics,brine
	Ford Motor Co., Rouge Steel	D-1		organics
		D-2		organics
	Hoskins Manufacturing Co.	1	733,000 g*	brine,acid,organics,metals
	Parke Davis & Co.	2		brine,organic,acid
		1		brine,acid,organics
		3		organics,acids,brine
		4		acid,organic,brine
	The Upjohn Co.	2		organics,inorganics (acids,brine)
	Total Petroleum Inc.*	1		organics,acids*
		2		organics,acids*
	Velsicol Chem. Corp.	2		brine
MS	Filtrol Corp.	1	130,000,000 g	acid wastewater and collected runoff
NC	HERCOFINA	OB 5	94,300,000*	ORGANIC ACIDS,METALS,OTHER INORGANICS
		I6	94,300,000 GAL*	ORGANIC ACIDS,HEAVY METALS,OTHER INORGANICS
		17 A	94,300,000	ORGANIC ACIDS,INORGANICS,HEAVY METALS
		OB 4	94,300,000*	ORGANIC ACIDS,HEAVY METALS,OTHER INORGANICS
OH	Armco Steel Corp.	1		acid,brine
		2		acid,brine,water
	Calhio Chemical Inc.*	1		brine,metal
		2		brine,Metals

NATURE AND VOLUME INJECTED BY CLASS I HW WELLS IN 1983

State	FACILITY NAME	WELL NO.	VOL(GAL)	WASTE TYPE
	Chemical Waste Management, Inc.	6	9,545,115 g*	Varies
		2	30,300,000 g*	varies
		3	16,062,615 g*	varies
		4	18,675,890 g*	varies
		5	26,789,685 g*	varies
		1A	15,016,140 g*	varies
	Sohio Chemical Company, Vistron	1	64,600,000 g	organically bound cyanide groups
		2	64,600,000 g	organically bound cyanide groups
		3	64,600,000 g	organically bound cyanide groups
	United States Steel Corporation	1	19,578,000 g*	organics,brine
		2*	38,338,000 g*	organics,brine
OK	Agrico Chem. co.	1	266,361,720 g*	metals,acid
	American Airlines Inc.	2		Metals,Inorganic
		1		cyanide,metals,solvents
	Chemical Resources Inc.	1	18,000,000 g	acid,brine,pesticides,organics
	Kaiser	1	48,700,000 g*	acid,brine,metals
		2	48,700,000 g*	acid,brine,metals
	Rockwell International	1	18,000,000 g*	alkaline,acid,organics
	Somex	1		metals,minerals
PA	Hammermill Paper Co.	3		pulping liquor
		2		pulping liquid
		1		pupling liquior
TX	Amoco Oil Co.	5		
		4		
		3	182,760,000 g*	organic,brine,spent caustic
		2	477,600 g*	organic,sour water,spent caustic
		1	2,613,000 g*	brine,organic,sour water,soent caustics
	Arco Chem. CO., Lyondale plant	3		organic
		2	36,134,720 g*	organic
		1	76,079,450 g*	organic
	Badische Corp.(Dow Badische Co.)	2	0 g	Aqueous,organic
		1	38,800,000 g*	aqueous,organic
	Browning - Ferris Industries	1		
	Celanese Chemical Co.	4		organic,acid
		1		acid,organic
		2		organic,acid
		3		organic,acid
	Celanese Chemical Co.,Clear Lake plant	1	143,000,00 g*	organic,acid,metals
		2	0 g	organic,acid,metals
	Champlin, Soltex & ICI, Corpus Christi Petro	2	15,600,000 g*	organic,caustic

NATURE AND VOLUME INJECTED BY CLASS I HW WELLS IN 1983

State	FACILITY NAME	WELL NO.	VOL(GAL)	WASTE TYPE
	Champlin, Soltex & ICI, Corpus Christi Petro	1	1,907,340 g*	caustic,organic
	Chaparral Disposal Co.(BFI)*	1	2,600,000 g*	acid,brine,pesticides,herbicides,organic
	Chemical Waste Management	1		brine,organic
	CHEMICAL WASTE MANAGEMENT,INC	1		PRIMARILY FROM PETROLEUM REFINING AND PETROCHEMICAL INDUSTRIES
		2		
	Cominco American Inc.	1	25,000,000*	
	Disposal Systems, Inc.	1	12,500,000 g*	organic,acid,brine,oesticides,metals,caustic,scrubber waste
	E. I. Dupont,Beaumount	2	106,200,000 g*	organic,acid,brine,mineral,metals
		1	122,900,000 g*	organic,acid,brine,minerals,metals
	E. I. Dupont,Houston plant	1	33,360,000 g*	acid,organic
		2	28,710,000 g*	acid,organic
		3		organic,acid
	E. I. Dupont,Ingleside	3	8,431,840 g*	alkaline,sodium hydroxide
		1		acid,brine,organic
		2	0 g*	alkaline,sodium hydroxide
	E. I. Dupont,Sabine River works	9		acid,brine
		10	new well	organic,acid,metals
		8	100,000 g*	organic,acid,metals
		7		
		6	3,458,000 g*	organic,acid,brine
		ADN3	44,888,000 g*	organic,acid,brine
		5	35,225,000 g*	organic,acid,brine
		4	213,423,000 g*	acid,brine,organic
	E. I. Dupont,Victoria	2	48,600,000 g	brine,organic,inorganic
		3	49,500,000 g	acid,brine,organic
		4	56,500,000 g	acid,brine,organic
		5	119,200,000 g	acid,brine,organic
		6	128,609,000 g	acid,brine,organic
		7	117,400,000 g	acid,brine,organic
		8	42,700,000 g	acid,brine,organic
		9	63,600,000 g	acid,brine,organic
		10	126,900,000 g	acid,brine,organic
		1	48,400,000 g	organic,inorganic
	Empak, Inc.	1	36,686,000 g*	organic,acidic,metals,inorganic,waste oil solvent
	General Aniline and Film Corp.	1	75,070,000 g*	organic,inorganic

NATURE AND VOLUME INJECTED BY CLASS I HW WELLS IN 1983

State	FACILITY NAME	WELL NO.	VOL(GAL)	WASTE TYPE
		2	0 g	organic, inorganic
		3	70,530,00 g*	organic, inorganic
	Gilbraltar Wastewaters, Inc.	1	44,430,720 g	Corrosive, acid, metals, organic
	Malone Service Co.	1	59,754,240 g	acid, brine
		2		organic
	Merichem co.	1	81,707,300 g*	brine, organic
	Monsanto Chemical Co., Chocolate Bayou	4*	0 g*	organic
		3	12,700,000 g*	organic
		1	500,000 g*	organic, brine, acid
		2	376,100,000 g*	organic
	Monsanto Co.	1	52,200,000 g*	organic
		2	241,668,000 g*	organic
	Phillips Chemical Co.	D-2	9,000,000 g*	brine
		D-3	24,000,000 g*	brine
	Potash Co. of America Division	1	151,075 g*	acid
	Shell Chemical Co.	1	28,000,000 g*	organic, brine
		2	57,000,000 g*	organic, water, brine
	SONICS INTERNATIONAL	1		
		2		
	Velsicol Chemical Co.	2		Organic
		1		organic, metals, acid,
		3		organic, metals, acid
	Vistron Corporation	1	26,208,000 g	organic, brine
		2		organic, brine
		3		organic
	Waste-water Inc.	1	51,840,000 g	organic, brine, acid
	Witco Chemical Co., Houston	2		acid, organic, brine
		1		organic, acid
	Witco Chemical Co., Marshall	3		acid,
		2	5,765,760 g	acid, organic
WY	WYCON CHEMICAL COMPANY			

SECTION 7

Data on

> "The dates and nature of the inspection of the injection well conducted by independent third parties or agents of State, Federal, or local government;"

DATE AND NATURE OF INSPECTIONS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	INSP.DATE	Type	Agency	Freq
AK	Arco Alaska Inc.	2*				
		1*				
AL	Stauffer Chemical Co.	3				
		1	83/07/00	scheduled	state	annual
		2	83/07/00	scheduled	state	annual
AR	Ethyl Corp.	1	83/09/26	schedule	state	annual
	Great Lakes Chemical Corp., Main plant	2	83/09/26	schedule	state	annual
	Great Lakes Chemical Corp., South plant	3X	83/09/26	schedule	state	annual
		4	83/09/26	schedule	state	annual
		5	83/09/26	schedule	state	annual
CA	Aerojet Strategic Propulsion Company	1	83/07/13	scheduled	CDOG	annual
	Rio Bravo Disposal Facility	1	85/01/12	periodic	EPA	
CO	SHELL OIL COMPANY					
	U.S. CORP. OF ENGINEERS AND CHEMICAL CORP.					
FL	Kaiser Aluminum & Chemical Co.	1	84/09/14	scheduled	state	annual
	Monsanto Company	3	83/07/00	periodic	DER	monthly report
		1	83/07/00	periodic	DER	monthly reports
		2	83/07/00	periodic	DER	monthly reported
IL	Allied Chem. Co.	1	83/08/17	periodic	IL,EPA	other
	Cabot Corp.	2	83/06/23	schedule	EPA	annual
		1	83/06/23	schedule	EPA	annual
	LTV Steel Company*	1	83/01/24	periodic	state	other
	Velsicol Corp.	1		periodic	state	other
		2		periodic	state	
IN	Bethlehem Steel Corporation,Burn Harbor Plant	2*				
		1*	81/07/07	periodic	state	other
	General Electric	2	83/09/28	periodic	state	other
		1	83/09/28	periodic	state	other
	Hoskins Manufacturing Co.	1				
	Indiana Farm Bureau Cooperative	IN3	80/12/04	periodic	state	other
	Inland Steel Company*	2	85/05/17	schedule	EPA	
		1	83/06/07	periodic	NPDES;RCRA*	periodic
	Midwest Steel	1*	83/06/22	routine	state	other
	Pfizer Mineral and Pigment Co.	1*				
		2*	81/05/20	schedule	EPA	
	Uniroyal Inc. *	1	81/04/30		state	annual
	United States Steel Corporation	IN9	75/00/00	periodic	state	annual
KS	Sherwin Williams	3		scheduled	state	quarterly

DATE AND NATURE OF INSPECTIONS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	INSP.DATE	Type	Agency	Freq
		2		scheduled	state	quarterly
	Vulcan Materials Co.	4	84/04/00	scheduled	state	quarterly
		3	84/04/20	scheduled	state	quarterly
		7	84/04/00		state	quarterly
		8	84/04/00	scheduled	state	quarterly
		9	84/04/00		state	quarterly
KY	E.I. Dupont De Nemours & Co.	1		periodic	state	quarterly
		2		periodic	state	quarterly
LA	American Cyanamid Co.	1	83/09/13	periodic	state	semi-ann
		2	83/09/13	periodic	state	semi-ann
		3	83/09/13	periodic	state	semi-ann
		4	83/09/13	periodic	state	semi-ann
		5	83/09/13	periodic	state	semi-ann
	Arcadian Corporation*	1	NA	NA	state	semi-ann
	Atlas Processing Co.	1		periodic	state	semi-ann
	BASF Wyandotte Corporation	D-1	84/05/00	periodic	state	semi-ann
	Borden Chemical Co.	1	83/06/14		EPA	
		2	83/06/14	periodic	state	semi-ann
		3	83/06/14	periodic	state	semi-ann
	Browning-Ferris Industries (CECOS)	1	84/06/14	periodic	state,EPA	semi-ann
	Chevron Chemical Co.	2	84/04/10	periodic	state	semi-ann
		3	84/04/10	periodic	state	semi-ann
	Citgo Petroleum Corp.*	1	84/03/16	periodic	state	semi-ann
		2	84/03/16	periodic	state	semi-ann
		4				
		3				
	E. I. Dupont,Laplace	7	84/05/16	periodic	state	semi-annu
		6	84/05/16	periodic	state	semi-ann
		5	84/05/16	periodic	state	semi-ann
		4	84/05/16	periodic	state	semi-ann
		3	84/03/16	periodic	state	semi-ann
		2	84/05/16	periodic	state	semi annua
		1	84/05/12	periodic	state	semi-ann
	Ethyl Corp. of Baton Rouge	1	84/05/22	semi-annual	state	semi-ann
	Georgia-Pacific Corporation	1	84/05/04	periodic	state	semi-ann
	International Minerals and Chemical Corp.	1	84/03/27	periodic	state	semi-ann
		2	84/03/27	periodic	state	semi-ann
	Monsanto Chemical Company,Luling plant	1	83/04/12	periodic	state	semi-ann
		2	83/04/12	periodic	state	seim-ann
	NASA, Michoud Assembly Facility*	2	83/09/09	periodic	state	semi-ann
		1	83/09/09	periodic	state	semi-ann
	Rollins Environmental Services of LA,Inc	1	85/01/03	scheduled,periodic	state	quarterly
	Rubicon Chemical Inc.	1	84/03/20	periodic	state	semi-ann
		2	84/03/20	periodic	state	semi-ann

DATE AND NATURE OF INSPECTIONS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	INSP.DATE	Type	Agency	Freq
		3	84/03/20	periodic	state	semi-ann
	Shell Chemical Company	4	84/06/29	periodic	state	semi-ann
		5	83/07/06	periodic	state	semi-ann
	Shell Oil Company, East site	4	84/08/15	scheduled	state	twice/year
		5	84/08/15	scheduled	state	twice/year
		6	84/08/15	scheduled	state	twic/year
		7	84/08/15	scheduled	state	twice/year
		8	84/08/15	scheduled	state	twice/year
		9	84/08/15	scheduled	state	semi-ann
		2		scheduled	state	twice/year
	Shell Oil Company, West site	8	84/08/15	scheduled	state	semi-ann
		2	84/08/15	scheduled	state	twic/year
		5	84/08/15	scheduled	state	twice/year
		6	84/08/15	scheduled	state	semi-ann
		9	84/08/15	scheduled	state	semi-ann
	Stauffer Chemical Company	2	84/04/17	quarterly	state	quarterly
		1		quarterly	state	quarterly
		3	84/04/17	quarterly	state	quarterly
	TENNECO OIL COMPANY	?				
		3	83/09/22	periodic	state	semi-ann
		4	83/08/31	periodic	state	semi-ann
	Texaco Inc.	5	84/05/02	periodic	state	semi-ann
		4	84/05/02	periodic	state	semi-ann
		2	84/05/02	periodic	state	semi-ann
		1	84/05/02	periodic	state	semi-ann
		6	83/12/09	periodic	state	semi-ann
	Uniroyal Inc.	2	83/07/12	periodic	state	semi-ann
		3	83/07/12	periodic	state	semi-ann
		1	83/07/12	periodic	state	semi-ann
	Universal Oil Products	7		periodic	state	semi-ann
		6	83/01/26	periodic	state	semi-ann
		5	83/01/26	periodic	state	semi-ann
	Witco Chemical Corporation, Gretna	1	83/09/14	periodic	state	semi-ann
	Witco Chemical Corporation, Hahnville	1	83/10/26	periodic	state	semi-ann
		2	83/10/26	periodic	state	semi-ann
	Wyandotte Chemical Corporation	D-2				
MI	BASF Wyandotte	1				
		2	83/00/00	annual	state	other
		3	83/00/00	annual	state	quarterly
	Detroit Coke Company	1	79/06/00	schedule		monthly
		2				
		3	79/06/28			monthly
	Dow Chem. Co.	5				
		2		periodic	state	quarterly
		4		scheduled	state	quarterly

DATE AND NATURE OF INSPECTIONS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	INSP.DATE	Type	Agency	Freq
		8		periodic	state	quarterly
	E.I. Dupont, Montaque	1		periodic		monthly ?
	Ford Motor Co., Rouge Steel	D-1		periodic		quarterly
		D-2		periodic	state	quarterly
	Hoskins Manufacturing Co.	1		periodic	state	other
	Parke Davis & Co.	2				
		1				
		3		periodic	state	quarterly
		4		periodic	state	quarterly
	The Upjohn Co.	2				
	Total Petroleum Inc.*	1		periodic	state	quarterly
		2		periodic	state	quarterly
	Velsicol Chem. Corp.	2		periodic	state	quarterly
MS	Filtrol Corp.	1	83/04/00	scheduled	state	twice/year
NC	HERCOFINA	OB 5				
		I6				
		17 A				
		OB 4	84/08/00			
OH	Armco Steel Corp.	1		periodic	state	other
		2		periodic	state	other
	Calhio Chemical Inc.*	1	81/12/00	periodic	state	other
		2		periodic	state	other
	Chemical Waste Management, Inc.	6	83/12/00	periodic	OH,EPA	annual
		2	84/07/00	periodic	OH,EPA	annual
		3	84/12/00	periodic	OH,EPA	annual
		4	84/02/00	periodic	OH,EPA	annual
		5	84/07/00	periodic	OH,EPA	annual
		1A	84/06/00	periodic	OH,EPA	annual
	Sohio Chemical Company, Vistron	1	83/04/00	schedule	state	annual
		2	83/04/00	schedule	state	annual
		3	83/04/00	schedule	state	annual
	United States Steel Corporation	1	84/06/27	periodic	state	annual
		2*	84/06/27	periodic	state	annual
OK	Agrico Chem. co.	1	83/04/15	schedule	state	annual
	American Airlines Inc.	2				
		1	84/05/02	schedule	state	annual
	Chemical Resources Inc.	1	84/12/12	scheduled	state	annual
	Kaiser	1		schedule	state	annual
		2	84/03/15	schedule	state	annual
	Rockwell International	1	84/04/12	annual	OSDH	annual
	Somex	1	83/08/19	schedule	state	annual
PA	Hammermill Paper Co.	3				

DATE AND NATURE OF INSPECTIONS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	INSP.DATE	Type	Agency	Freq
		2				
		1				
TX	Amoco Oil Co.	5				
		4				
		3	84/02/15	schedule	state	annual
		2	84/02/15	schedule	state	annual
		1	84/02/15	schedule	state	annual
	Arco Chem. CO., Lyondale plant	3		schedule	state	annual
		2	84/03/13	schedule	state	annual
		1	84/03/13	schedule	state	annual
	Badische Corp.(Dow Badische Co.)	2	84/04/00	annual	state	annual
		1	84/04/00	schedule	state	annual
	Browning - Ferris Industries	1				
	Celanese Chemical Co.	4	84/02/13	schedule	state	annual
		1	84/02/13	schedule	state	annual
		2	84/02/13		state	annual
		3	84/02/13	schedule	state	annual
	Celanese Chemical Co.,Clear Lake plant	1	84/03/15	schedule	state	annual
		2	84/03/15	schedule	state	annual
	Champlin, Soltex & ICI, Corpus Christi Petro	2	84/00/00	schedule	state UIC	annual
		1	84/00/00	schedule	state UIC	annual
	Chaparral Disposal Co.(BFI)*	1	84/05/00	periodic	state	annual
	Chemical Waste Management	1		schedule	state	annual
	CHEMICAL WASTE MANAGEMENT,INC	1	85/01/00	REGULAR		QUATERLY
		2				
	Cominco American Inc.	1				
	Disposal Systems, Inc.	1	84/03/14	schedule	state TDWR	annual
	E. I. Dupont,Beaumount	2	83/05/04	schedule	state	annual
		1	83/05/04	schedule	state,TDWR	annual
	E. I. Dupont,Houston plant	1	84/03/15	schedule	state	annual
		2	84/03/15	schedule	state	annual
		3	84/03/15	schedule	state	annual
	E. I. Dupont,Ingleside	3	83/12/28	schedule	state	annual
		1		schedule	state	annual
		2	83/12/28	schedule	state	annual
	E. I. Dupont,Sabine River works	9		schedule	state	annual
		10		schedule	state	annual
		8	83/09/21	schedule	state	annual
		7				
		6	83/09/21	schedule	state	annual
		ADN3	83/09/21	schedule	state	annual
		5	83/09/21	schedule	state	annual
		4	83/09/21	schedule	state	annual
	E. I. Dupont,Victoria	2				
		3				

DATE AND NATURE OF INSPECTIONS OF CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	INSP.DATE	Type	Agency	Freq
		4				
		5				
		6				
		7				
		8				
		9				
		10				
		1	84/04/25	compliance	TDWR	2/year
	Empak, Inc.	1	84/03/14	periodic	TDWR	annual
	General Aniline and Film Corp.	1	84/03/09	schedule	state	annual
		2	84/03/09	schedule	state	annual
		3	83/10/24	schedule	state	annual
	Gilbraltar Wastewaters, Inc.	1	82/11/02		state	
	Malone Service Co.	1	83/02/14	schedule	state	annual
		2		schedule	state	annual
	Merichem co.	1	85/02/00	schedule	state	annual
	Monsanto Chemical Co., Chocolate Bayou	4*				
		3	83/02/16		state	annual
		1	83/02/16	sched. & per	state	annual
		2	83/02/16		state	
	Monsanto Co.	1	84/02/00	schedule	state	annual
		2	83/02/16	periodic	state	annual
	Phillips Chemical Co.	D-2	83/10/00	schedule	state TDWR	yearly
		D-3	83/10/00	schedule	state TDWR	annual
	Potash Co. of America Division	1	84/01/12	scheduled	TDWR(state)	annual
	Shell Chemical Co.	1	84/03/13	schedule	state	annual
		2	84/03/18	schedule	state	annual
	SONICS INTERNATIONAL	1				
		2				
	Velsicol Chemical Co.	2				
		1	83/02/03	schedule	state	annual
		3	83/02/03	schedule	state	annual
	Vistron Corporation	1	82/03/17	schedule	state	annual
		2	83/05/25	schedule	state	annual
		3	83/05/25	schedule	state	annual
	Waste-water Inc.	1	83/04/26	schedule	state	annual
	Witco Chemical Co.,Houston	2	84/03/12	schedule	state	annual
		1	84/03/12	schedule	state	annual
	Witco Chemical Co.,Marshall	3	83/11/16	schedule	state	annual
		2	83/11/16	schedule	state	annual
WY	WYCON CHEMICAL COMPANY					

SECTION 8

Data on

> "The name and address of all owners and operators of the well and any disposal facility associated with it;"

NAME AND ADDRESS OF CLASS I HW WELLS

State	FACILITY NAME	Address	CITY	Zip
AK	Arco Alaska Inc.	p.o. box 100360	Anchorage	99510
		p.o. box 100360	Anchorage	99510
AL	Stauffer Chemical Co.	p.o. box 32	Cold Creek	36512
		p.o. box 32	Cold Creek	36512
		p.o. box 32	Cold Creek	36512
AR	Ethyl Corp.	p.o. box 729	Magnolia	71753
	Great Lakes Chemical Corp., Main plant	p.o. box 1958	El Dorado	71730
	Great Lakes Chemical Corp., South plant	Route 2, Box 162-X	El Dorado	71730
		Route 2, box 162-X	El Dorado	71730
		route 2, box 162-x	El Dorado	71730
CA	Aerojet Strategic Propulsion Company	P.O. Box 15699C	Sacramento	75813
	Rio Bravo Disposal Facility	p.o. box 5398	Bakersfield	93388
CO	SHELL OIL COMPANY	1700 BROADWAY	DENVER	
	U.S. CORP. OF ENGINEERS AND CHEMICAL CORP.	ROCKY MOUNTAIN ARSENAL		
FL	Kaiser Aluminum & Chemical Co.	p.o. box 646	Mulberry	33860
	Monsanto Company	SR 297 and SR 292, P.O. Box 12830	Pensacola	32575
		SR 297 and SR 292, P.O. Box 12830	Pensacola	32575
		SR 297 and SR 292, P.O. Box 12830	Pensacola	32575
IL	Allied Chem. Co.	Danville Works, p.o. box 13	Danville	61832
	Cabot Corp.	CAB-O-SIL Division	Tuscola	61953
		CAB-O-SIL Division	Tuscola	61953
	LTV Steel Company*	Hennepin Works	Hennepin	61327
	Velsicol Corp.	p.o. box 394	Marshall	62441
		p.o. box 394	Marshall	62441
IN	Bethlehem Steel Corporation,Burn Harbor Plant	P. o. box 248	Chesterton	46304
		P.O.Box 248	Chesterton	46304
	General Electric	1 Lexon Lane	Mt. Vernon	47260
		1 Lexon Lane	Mt. Vernon	47260
	Hoskins Manufacturing Co.	71103 County Rd. 23	New Paris	46523
	Indiana Farm Bureau Cooperative	1200 Refinery Rd.	Mt. Vernon	47620
	Inland Steel Company*	3210 Watling street	East Chicago	46312
		3210 Watling Street	East Chicago	46312
	Midwest Steel	National Steel corp.	Portage	46368
	Pfizer Mineral and Pigment Co.	4901 Evans Ave.	Valparaiso	
		4901 Evans Ave.	Valparaiso	
	Uniroyal Inc. *	Newport Army Ammunition Plant, P.O.Box 458	Newport	47966
	United States Steel Corporation	P.O.BOX 59	Gary	46401
KS	Sherwin Williams	p.o. box 855	Coffeyville	67337

NAME AND ADDRESS OF CLASS I HW WELLS

State	FACILITY NAME	Address	CITY	Zip
		p.o. box 855	Coffeyville	67337
	Vulcan Materials Co.	p.o. box 12283	Wichita	67277
		p.o. box 12283	Wichita	67277
		p.o. box 12283	Wichita	67277
		p.o. box 12283	Wichita	67277
		p.o. box 12283	Wichita	67277
KY	E.I. Dupont De Nemours & Co.	p.o. box 1378	Louisville	40201
		p.o. box 1378	Louisville	40201
LA	American Cyanamid Co.	10800 River Rd.	Westwego	70094
		10800 River road	Westwego	70094
		10800 River Road	Westwego	70094
		10800 River Road	Westwego	70094
		10800 River Road	Westwego	70094
	Arcadian Corporation*	p.o. box 307	Geismar	70734
	Atlas Processing Co.	3333 Midway Ave.	Shreveport	71109
	BASF Wyandotte Corporation	p.o. box 457	Geismar	70734
	Borden Chemical Co.	p.o. box 427	Geismar	70734
		p.o. box 427	Geismar	70234
		p.o. box 427	Geismar	70734
	Browning-Ferris Industries (CECOS)	p.o. box 5416	Lake Charles	70606
	Chevron Chemical Co.	p.o. box 70	Belle Chasse	70037
		p.o. box 70	Belle Chasse	70037
	Citgo Petroleum Corp.*	p.o. box 1562	Lake Charles	70602
		p.o. box 1562	Lake Charles	70602
		P.O. Box 1562	Lake Charles	70602
		P.O. box 1562	Lake Charles	70602
	E. I. Dupont, Laplace	p.o. box 2000	Laplace	70068
		p.o. box 2000	Laplace	70068
		p.o. box 2000	Laplace	70068
		p.o. box 2000	Laplace	70068
		p.o. box 2000	Laplace	70068
		p.o. box 2000	Laplace	70068
		p.o. box 2000	Laplace	70068
	Ethyl Corp. of Baton Rouge	p.o. box 341	Baton Rouge	70821
	Georgia-Pacific Corporation	p.o. box 629	Plaquemine	70765 *
	International Minerals and Chemical Corp.	p.o. box 626	Sterlington	71280
		p.o. box 626	Sterlington	71280
	Monsanto Chemical Company, Luling plant	p.o. box 174	Luling	70070
		p.o. box 174	Luling	70070
	NASA, Michoud Assembly Facility*	p.o. box 29300	New Orleans	70189
		p.o. box 29300	New Orleans	70189
	Rollins Environmental Services of LA, Inc	Route 2, box 1200	Plaquemine	70764
	Rubicon Chemical Inc.	p.o. box 517	Geismar	70734
		p.o. box 517	Geismar	70734

NAME AND ADDRESS OF CLASS I HW WELLS

State	FACILITY NAME	Address	CITY	Zip
		p.o. box 517	Geismar	70734
	Shell Chemical Company	p.o. box 500	Geismar	70734
		p.o. box 500	Geismar	70734
	Shell Oil Company, East site	p.o.box 10	Norco	70079
		p.o. box 10	Norco	70079
		p.o. box 10	Norco	70079
		p.o. box 10	Norco	70079
		p.o. box 10	Norco	70079
		p.o. box 10	Norco	70079
		p.o. box 10	Norco	70079
	Shell Oil Company, West site	p.o. box 10	Norco	70079
		p.o. box 10	Norco	70079
		p.o. box 10	Norco	70079
		p.o. box 10	Norco	70079
		p.o. box 10	Norco	70079
	Stauffer Chemical Company	p.o.box 86	St. Gabriel	70776
		p.o. box 86	St. Gabriel	70776
		P.O. Box 86	St. Gabriel	70776
	TENNECO OIL COMPANY	PO BOX 1007	CHALMETTE	70044
		p.o. box 1007	Chalmette	70044
		p.o. box 1007	Chalmette	70044
	Texaco Inc.	p.o. box 37	Convent	70723
		p.o. box 37	Convent	70723
		p.o. box 37	Convent	70723
		p.o. box 37	Convent	70723
		p.o. box 37	Convent	70723
	Uniroyal Inc.	p.o.box 397	Geismar	70734
		p.o. box 397	Geismar	70734
		p.o. box 397	Geismar	70734
	Universal Oil Products	p.o. box 21566	Shreveport	71120
		p.o. box 21566	Shreveport	71120
		p.o. box 21566	Shreveport	71120
	Witco Chemical Corporation,Gretna	p.o. box 308	Gretna	70054
	Witco Chemical Corporation,Hahnville	p.o. box 310	Hahnville	70057
		p.o. box 310	Hahnville	70057
	Wyandotte Chemical Corporation	P.O.BOX 457	GEISMER	70734
MI	BASF Wyandotte	491 Columbia Ave.	Holland	49423
		491 Columbia Ave.	Holland	49423
		491 Columbia Ave.	Holland	49423
	Detroit Coke Company	7817 West Jefferson	Detroit	48209
		7817 West Jefferson	Detroit	48209
		7817 W. Jefferson	Detroit	
	Dow Chem. Co.	409 Building	Midland	48640
		409 Building	Midland	48640
		409 Building	Midland	48640

NAME AND ADDRESS OF CLASS I HW WELLS

State	FACILITY NAME	Address	CITY	Zip
		409 Building	Midland	48640
	E.I. Dupont,Montaque	p.o. box 49437	Montague	49437
	Ford Motor Co., Rouge Steel	3001 Miller Rd.	Dearborn	48121
		3001 Miller Road	Dearborn	48121
	Hoskins Manufacturing Co.	p.o. box 1278	Mio	48647
	Parke Davis & Co.	182 Howard Ave.	Holland	49423
		182 Howard Ave.	Holland	49423
		188 Howard Ave.	Holland	49423
		188 Howard Ave.	Holland	49423
	The Upjohn Co.	7171 Portage	Kalamazoo	49001
	Total Petroleum Inc.*	East Superior St.	Alma	48801
		East Superior St.	Alma	48801
	Velsicol Chem. Corp.	500 Bankson St.	St. Louis	48880
MS	Filtrol Corp.	p.o. box 8337	Jackson	39204
NC	HERCOFINA	PO BOX 327	WILMINGTON	28402
		P.O. BOX 327(HWY 321N)	WILMINGTON	28402
		P.O.BOX 327(HWY 421 N)	WILMINGTON	28402
		POBOX 327	WILMINGTON	28402
OH	Armco Steel Corp.	p.o. box 600	Middletown	45042
		p.o. box 600	Middletown	45042
	Calhio Chemical Inc.*	p.o. box 86	Perry	44081
		p.o. box 86,3647 SHEPERD STREET	Perry	44081
	Chemical Waste Management, Inc.	3956 State Route 412	Vickery	43464
		3956 State Route 412	Vickery	43464
		3956 State Route 412	Vickery	43464
		3956 State Route 412	Vickery	43464
		3956 State Route 412	Vickery	43464
		3956 State Route 412	Vickery	43464
	Sohio Chemical Company, Vistron	p.o. box 628	Lima	45802
		p.o. box 628	Lima	45802
		p.o. box 628	Lima	45802
	United States Steel Corporation	p.o. box 127	Ironton	45638
		p.o. box 127	Ironton	45638
OK	Agrico Chem. co.	p.o. box 456	Catoosa	74015
	American Airlines Inc.	3800 North Mingo Rd.	Tulsa	74151
		p.o. box 51009	Tulsa	74151
	Chemical Resources Inc.	2904 Fourth National bank building	Tulsa	74119
	Kaiser	p.o. box 246	Pryor	74361
		p.o. box 246	Pryor	74361
	Rockwell International	p.o. box 51808	Tulsa	74158
	Somex	p.o. box 1216	Bartlesville	74003
PA	Hammermill Paper Co.	P.O. Box 1440, East Lake Rd	Hammermill	

NAME AND ADDRESS OF CLASS I HW WELLS

State	FACILITY NAME	Address	CITY	Zip
			Hammermill	
			Hammermill	
TX	Amoco Oil Co.	p.o. box 401	Texas City	77590
		p.o. box 401	Texas City	77590
		p.o. box 401	Texas City	77590
		p.o. box 401	Texas City	77590
		p.o. box 401	Texas City	77590
	Arco Chem. CO., Lyondale plant	p.o. box 777	Chanelview	77530
		p.o. box 777	Channelview	77530
		p.o. box 777	Channelview	77530
	Badische Corp. (Dow Badische Co.)	602 Copper road	Freeport	77541*
		602 Cooper Rd.	Freeport	77541
	Browning - Ferris Industries	1020 Holcombe Blvd.	Houston	77030
	Celanese Chemical Co.	p.o. box 509	Bay city	77414
		p.o. box 509	Bay City	77414
		p.o. box 509	Bay City	77414
		p.o. box 509	Bay City	77414
	Celanese Chemical Co., Clear Lake plant	p.o. box 58190	Houston	77258*
		p.o. box 58190	Houston	77258*
	Champlin, Soltex & ICI, Corpus Christi Petro	p.o. box 10940	Corpus Christi	78410*
		p.o. box 10940	Corpus Christi	18410*
	Chaparral Disposal Co. (BFI)*	p. o. box 6509	Odessa	79760
	Chemical Waste Management	p.o. box 9295	Corpus Christi	78417
	CHEMICAL WASTE MANAGEMENT, INC	PO BOX 2563	PORT ARTHUR	77640
		PO BOX 2563	PORT ARTHUR	77640
	Cominco American Inc.			
	Disposal Systems, Inc.	p.o. box 1505	Houston	77536
	E. I. Dupont, Beaumount	p. o. Box 3269	Beaumount	77704
		p.o. box 3269	Beaumount	77704
	E. I. Dupont, Houston plant	p. o. box 347	La Porte	77571
		p.o. box 347	La Porte	77571
		p. o. box 347	La Porte	77571
	E. I. Dupont, Ingleside	p.o. box JJ	Ingleside	78362
		p.o. box JJ	Ingleside	78362
		p.o. box JJ	Ingleside	78362
	E. I. Dupont, Sabine River works	P. O. Box 1089	Orange	77630
		p.o. box 1089	Orange	77630
		p.o. box 1089	Orange	77630
		p.o. box 1089	Orange	77630
		p.o. box 1089	Orange	77630
		p.o. box 1089	Orange	77630
		p.o. box 1089	Orange	77630
		p. o. box 1089	Orange	77630
	E. I. Dupont, Victoria	p.o. box 2626	Victoria	77902
		p.o. box 2626	Victoria	77902

NAME AND ADDRESS OF CLASS I HW WELLS

State	FACILITY NAME	Address	CITY	Zip
		p.o. box 2626	Victoria	77902
		p.o. box 2626	Victoria	77902
		p.o. box 2626	Victoria	77902
		p.o. box 2626	Victoria	77902
		p.o. box 2626	Victoria	77902
		p.o. box 2626	Victoria	77902
		p.o. box 2626	Victoria	77902
		p.o. box 2626	Victoria	77902
	Empak, Inc.	2000 West Loop South, Suite 1800	Houston	77027
	General Aniline and Film Corp.	p. o. box 2141	Texas City	77011
		p.o. box 2141	Texas City	77011
		p. o. box 2141	Texas City	77011
	Gilbraltar Wastewaters, Inc.	p.o. box 9987	Austin	78766
	Malone Service Co.	p.o. box 709	Texas City	77590
		p. o. box 709	Texas City	77590
	Merichem co.	1914 Haden Road	Houston	77530
	Monsanto Chemical Co., Chocolate Bayou	p.o. box 711	Alvin	77511
		p.o. box 711	Alvin	77511
		p.o. box 711	Alvin	77511
		p.o. box 711	Alvin	77511
	Monsanto Co.	p.o. box 1311	Texas City	77590
		p.o. box 1311	Texas City	77590
	Phillips Chemical Co.	p. o. box 968	Phillips	79071
		p.o. box 1231	Phillips	79071
	Potash Co. of America Division	5 miles NE of Dumas	Dumas	79029
	Shell Chemical Co.	p.o. box 2633	Deer Park	77536
		p.o. box 2633	Deer Park	77536
	SONICS INTERNATIONAL		RANGER	
			RANGER	
	Velsicol Chemical Co.	Route 4, box 327	Beaumont	77705
		p.o. box 327	Beaumont	77705
		p.o. box 327	Beaumont	77705
	Vistron Corporation	p.o. box 659	Port Lavaca	77979
		p.o. box 659	Port Lavaca	77979
		p.o.box 659	Port Lavaca	77979
	Waste-water Inc.	5607 Candlewood	Guy	78056
	Witco Chemical Co.,Houston	3230 Brookfield	Houston	77045
		3230 Brookfield	Houston	77045
	Witco Chemical Co.,Marshall	p.o. box 1439	Marshall	75670
		p.o. box 1439	Marshall	75670
WY	WYCON CHEMICAL COMPANY		CHEYENNE	

SECTION 9

Data on

> "The identification of all wells at which enforcement actions have been initiated under this Act (by reason of well failure, operator error, groundwater contamination or for other reasons) and an identification of the wastes involved in such enforcement actions;" and

NONCOMPLIANCE IN CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	NONCOMPL.	Type
AK	Arco Alaska Inc.	2* 1*		
AL	Stauffer Chemical Co.	3	none	
		1	can't perform mechanicl i.test due to cr imp	to be abandoned in 84
		2	none	
AR	Ethyl Corp.	1		
	Great Lakes Chemical Corp., Main plant	2	annular press. leake (83/09/26);RES: remedial act.pending	notice of violation 83/09/26
	Great Lakes Chemical Corp., South plant	3X 4		
		5	annulus on vacuum indicated leak (83/09/26);RE:pending	notice of violation (83/10/24)
CA	Aerojet Strategic Propulsion Company	1	none on record	
	Rio Bravo Disposal Facility	1	THE STATE WAS NOT AWARE OF THIS FACILITY INJECTING HW*	
CO	SHELL OIL COMPANY			
	U.S. CORP. OF ENGINEERS AND CHEMICAL CORP.			
FL	Kaiser Aluminum & Chemical Co.	1	none*	
	Monsanto Company	3	none	
		1	none	
		2	none	
IL	Allied Chem. Co.	1	monitoring and reporting(none reported on questionnaire)	informal
	Cabot Corp.	2 1	none	
	LTV Steel Company*	1	well construction & operation;RESOLUTION: workover	notice of violation
	Velsicol Corp.	1	surface problems tied into injection wel	informal

NONCOMPLIANCE IN CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	NONCOMPL.	Type
			l through permit	
		2	surface problems tied into injection wel l through permit	informal
IN	Bethlehem Steel Corporation, Burn Harbor Plant	2*		
	Bethlehem Steel Corporation, Burn Harbor Plant	1*		
	General Electric	2	monitoring and reporting	
		1		
	Hoskins Manufacturing Co.	1		
	Indiana Farm Bureau Cooperative	IN3	none	
	Inland Steel Company*	2		
		1	none	
	Midwest Steel	1*	none	
	Pfizer Mineral and Pigment Co.	1*	Hydrochloric spill 82/04/09	
		2*		
	Uniroyal Inc. *	1		
	United States Steel Corporation	IN9	none	
KS	Sherwin Williams	3	none	
		2	none	
	Vulcan Materials Co.	4	none	
		3	none	
		7	none	
		8	none	
		9	none	
KY	E.I. Dupont De Nemours & Co.	1	none	
		2	none	NA
LA	American Cyanamid Co.	1	monitoring and reporting*	notice of violation
		2	monitoring and reporting	notice of violation
		3	monitoring and reporting	notice of violation
		4		
		5		
	Arcadian Corporation*	1	NA	NA
	Atlas Processing Co.	1		
	BASF Wyandotte Corporation	D-1	none	
	Borden Chemical Co.	1	monitoring and reporting	notice of violation
		2	monitoring and reporting	notice of violation
		3	monitoring and reporting	notice of violation
	Browning-Ferris Industries (CECOS)	1	monitoring and reporting; casing leak (1	notice of violation

NONCOMPLIANCE IN CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	NONCOMPL.	Type
			982, corrected)*	
	Chevron Chemical Co.	2	monitoring records, inconsisitency in annulus pressure	notice of noncompliance
		3	monitoring records; inconsistency in annulus pressure	notie of Noncompliance
	Citgo Petroleum Corp.*	1	well operation,monitoring and reporting*	
		2		
		4		
		3		
	E. I. Dupont,Laplace	7	none	
		6		
		5		
		4	none	
		3	None	
		2	none	
		1	annulus monitoring	
	Ethyl Corp. of Baton Rouge	1	none	none
	Georgia-Pacific Corporation	1		
	International Minerals and Chemical Corp.	1	monitoring and reporting	informal letter
	International Minerals and Chemical Corp.	2	monitoring, reporting	informal letter
	Monsanto Chemical Company,Luling plant	1		
		2		
	NASA, Michoud Assembly Facility*	2		
		1		
	Rollins Environmental Services of LA,Inc	1	monitoring equip. not installed by 83/04/23;Resolved	administrative*
	Rubicon Chemical Inc.	1	monitoring and reporting*	notice of violation
		2	monitoring and reporting	notice of violation
		3	well operation,monitoring and reporting*	notice of violation
	Shell Chemical Company	4	lack of inhibitor fluid in annulus	notice of violation
		5	lack of inhibitor fluid in annulus	notice of violation
	Shell Oil Company, East site	4	N/A	
		5	N/A	
		6	N/A	
		7	N/A	
		8	N/A	

NONCOMPLIANCE IN CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	NONCOMPL.	Type	
		9	N/A		
		2			
	Shell Oil Company, West site	8	N/A		
		2	N/A		
		5	N/A		
		6	N/A		
		9	N/A		
	Stauffer Chemical Company	2	none		
		1	none		
		3	none		
	TENNECO OIL COMPANY	?	USDW CONTAMINATION,CLEAN UP IN PROCESS*		
		3	Barrier posts and breaks in contiuous monitoring	NOV & LOD	
		4	Barrier posts and breaks in contiuous monitoring	NOV & LOD	
	Texaco Inc.	5	monitoring and reporting	letter of warning	
		4	monitoring & reporting	letter of warning .	
		2	monitoring & reporting;Resolution:installa. of recorder	letter of warning	
		1	continuous monitoring	letter of warning	
		6	monitoring and reporting*	letter of warning	
	Uniroyal Inc.	2	none		
		3	none		
		1	none		
	Universal Oil Products	7			
		6	monitoring and reporting; Resolution: pending	notice of violation	
		5	monitoring and reporting; Resolution:pending	notice of violation	
	Witco Chemical Corporation,Gretna	1	no apparent ID#;inconsistent monitoring equipment*	notice of violation	83/09/14
	Witco Chemical Corporation,Hahnville	1	None		
		2	annulus - injection communication;resolved*	notice of violation	
	Wyandotte Chemical Corporation	D-2			

NONCOMPLIANCE IN CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	NONCOMPL.	Type
MI	BASF Wyandotte	1		
		2	none	
		3	none	
	Detroit Coke Company	1		
		2		
		3		
	Dow Chem. Co.	5		
		2	none	
		4	none	
		8	none	
	E.I. Dupont,Montaque	1		
	Ford Motor Co., Rouge Steel	D-1	none	
		D-2	none	
	Hoskins Manufacturing Co.	1	Some incident inferred; no details available*	notice of violation
	Parke Davis & Co.	2		
		1		
		3		
		4		
	The Upjohn Co.	2		
	Total Petroleum Inc.*	1	none	
		2	none	
	Velsicol Chem. Corp.	2	none*	
MS	Filtrol Corp.	1	none	
NC	HERCOFINA	OB 5	SUSPECTED USDW CONTAMINATION-MIGRATION BLACK CREEK	
		I6	SUSPECTED USDW CONTAMINATION-WASTE MIGRATION BLACK CREEK.	
		17 A	SUSPECTED USDW CONTAMINATION-MIGRATION BLACK CREEK	
		OB 4	SUSPECTED USDW CONTAMINATION-WASTE MIGRATION BLACK CREEK	
OH	Armco Steel Corp.	1		
		2		
	Calhio Chemical Inc.*	1		
		2		
	Chemical Waste Management, Inc.	6	well failed mechanical integrity test	judicial
		2	well failed mechanical integrity test	judicial

NONCOMPLIANCE IN CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	NONCOMPL.	Type
		3	well failed mechanical integrity test	judicial
		4	well failed mechanical integrity test	judicial
		5	well failed mechanical intergrity test	judicial
		1A	well failed mechanical integrity test	judicial
	Sohio Chemical Company, Vistron	1	well shut down on 82/11/10;inj. press.? ;resolved.*	
		2	contamination noted in several monitoring wells.	
		3	contamination noted in several monitoring wells.	
	United States Steel Corporation	1	none	NA
		2*	communication to annulus	Informal
OK	Agrico Chem. co.	1		surety bond
	American Airlines Inc.	2	none	
		1	failed mechanical integrity test;RE:pending 83/11/9.	notice of violation
	Chemical Resources Inc.	1	well construc.,operation,monitoring and reporting*	judicial
	Kaiser	1		
		2		
	Rockwell International	1	personnel training records incomplete	notice
	Somex	1		
PA	Hammermill Paper Co.	3	fractured confining zone*, fluid leak	judicial
		2	fractured confining zone*, fluid leak	judicial
		1	fractured confining zone*, FLUID LEAK	judicial
TX	Amoco Oil Co.	5		
		4		
		3	none	
		2	exceeded permitted inj. rate for 6 consecutive months	
		1	none	
	Arco Chem. CO., Lyondale plant	3		
		2	none	
		1	none	

NONCOMPLIANCE IN CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	NONCOMPL.	Type
	Badische Corp.(Dow Badische Co.)	2	none	
		1	none	
	Browning - Ferris Industries	1	THIS WELL PLUGGED UP,HIGH INJECTION PRESSURES*	INVESTIGATION
	Celanese Chemical Co.	4		
		1		
		2		
		3		
	Celanese Chemical Co.,Clear Lake plant	1	none	
		2		
	Champlin, Soltex & ICI, Corpus Christi Petro	2	none	
	Champlin, Soltex & ICI, Corpus Christi Petro	1	none	
	Chaparral Disposal Co.(BFI)*	1	none	
	Chemical Waste Management	1		
	CHEMICAL WASTE MANAGEMENT,INC	1		
		2		
	Cominco American Inc.	1		
	Disposal Systems, Inc.	1	none	
	E. I. Dupont,Beaumount	2	none	
		1	none	
	E. I. Dupont,Houston plant	1	none	
		2	none	
		3	none	
	E. I. Dupont,Ingleside	3	none	
		1		
		2	none	
	E. I. Dupont,Sabine River works	9		
		10		
		8	none	
		7		
		6		
		ADN3		
		5		
		4		
	E. I. Dupont,Victoria	2		
		3		
		4		
		5		
		6		

NONCOMPLIANCE IN CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	NONCOMPL.	Type
		7	none	
		8	none	
		9	none	
		10		
		1	none	
	Empak, Inc.	1	exceeded inj. rate in 1981.	administrative
	General Aniline and Film Corp.	1	none	
		2	none	
		3	injected rate exceeded MAX on 82/11/23.	
	Gilbraltar Wastewaters, Inc.	1		
	Malone Service Co.	1		
		2	*	notice of violation
	Merichem co.	1	none	
	Monsanto Chemical Co., Chocolate Bayou	4*		
		3		
		1		
		2		
	Monsanto Co.	1	none	
		2	none	
	Phillips Chemical Co.	D-2	none	
		D-3	none	
	Potash Co. of America Division	1	calibration of flow totalizer high (not "0" with no flow)	informal
	Shell Chemical Co.	1	none	
		2	none	
	SONICS INTERNATIONAL	1	WELL BLOW OUT*	
		2	WELL BLOW OUT, SURFACE SPILL, SURFACE CLEAN UP	
	Velsicol Chemical Co.	2	VIOLATION OF PH LIMITATIONS, USDW CONTAMINATION	
		1		
		3	pH VIOLATION CAUSED THE CORROSION OF WELL, USDW CONTAMINAT	
	Vistron Corporation	1		
		2		
		3		
	Waste-water Inc.	1		
	Witco Chemical Co., Houston	2	out of compliance on injec. & annulus pr	

NONCOMPLIANCE IN CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	NONCOMPL.	Type
			ess. & recording	
	Witco Chemical Co.,Marshall	1 3 2		
WY	WYCON CHEMICAL COMPANY			

ADDITIONAL NONCOMPLIANCE IN CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	Attachment
CA	Rio Bravo Disposal Facility	1	1. Original hole drilled:1938 redrilled:1953 converted to injection well:1983 2. Injected fluid TDS (ppm), pH, Specific gravity, acids (ppm), organics (ppm), inorganics (ppm), metals (ppm): wide ranges 3. Reported annual volume injected: operation since 84/05/01. 4. THE STATE CLIAIMS THAT THEY DID NOT KNOW OF THIS PLANT INJECTING HW. HOWEVER IN THE VISIT TO THE SITE BY THE TASK FORCE, THIS WAS DISCUSSED TO SOME LENGHT. THE STATE CLOSED THIS FACILITY FOR A FEW DAYS IN JAN/FEB 1984 BECAUSE THE SURFACE PIPING WAS NOT PROPERLY PROTECTED. THIS INFO WAS GATHERED FROM REGION IX AND PAT HUFF WHO WAS DOING A STUDY FOR THE SPEAKER OF THE HOUSE (CA) 2/85.
FL	Kaiser Aluminum & Chemical Co.	1	(wc)Waste Components: COMPONENTS PPM Chlorides 28,600 Hydrochloric acid 21,600 Sodium 39,000 Fluorides 3,300 Ca 4,800 Mg 1,600 2. permits: other: ID 53-4542 3. THE WASTE APPARENTLY DISSOLVED PART OF THE INJECTION ZONE. WHEN DOING A CEMENT SQUEEZE JOB, THE HIGH PRESSURES CAUSED ABOUT 100' OF THE CASING TO COLLAPSE. DIESEL FUEL WAS INJECTED TO PROTECT THE LOWER PART OF THE CASING AND THE NEW PACKER. tHIS INFO WAS OBTAINED FROM THE SITE VISIT REPORT.
LA	American Cyanamid Co.	1	1. Noncompliance actions continued: Resolution of enforcement action: monitoring devices will be inspected twice daily, pen system is being replace. Company reported (84/10/03) that wells comply with class I standards. 2. Permits: RCRA: LAD 008175390 NPDES: LA 0004367 LA Stream Control Comm. application on file -revised 79/07/12. LA DNR Haz. Waste Notif. #GD-329 LA Solid Waste Mgt. #P0001 LA DNR office of Conserv. Deepwells 1-5 LA Air Control Comm. #120,329,546,594,644,677T,707T,733,1098T, 1207T,1226,1287. 3. TDS PH SG K011 21%=210,000 0-6 1.1-1.3 K013 3,000 9-11 1.0 (wc)Waste Components: COMPONENTS PPM K011 NH3-N 1.3% = 13,000 waste acid SO4 5.3% = 53,000

ADDITIONAL NONCOMPLIANCE IN CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	Attachment
			K013 CN .18%= 1,800 Lagoon Effluent 4. Annual volume injected: 48,000,000 g 1983; 169,00,000 g 1982
	Browning-Ferris Industries (CECOS)	1	1. Date well drilled continued: originally drilled in 1951. 2. Permits: RCRA code from O.S.W: LAD 000618298 RCRA: applied Part B due to Le D.E.Q 84/10/10 NPDES: LA 005882 UIC: applied 82/11/00 3. Annual volume injected: 32,087,454 g 83/00/00 38,382,876 g 82/00/00 4. Noncompliance continued: minor leak on well-head, and incorrect serial # on I.D. sign. Both problems resolved. (wc)Waste Components: COMPONENTS PPM COD 15,000 TOC 5,000 Inorganics 3,000 Water 96% = 960,000 5. CONTAMINATION OF A SURFACE AQUIFER AT THE SITE ATTRIBUTED TO SURFACE PITS AND NOT THE WELL (BY THE STATE). 6. INJECTION HAS STOPPED UNTIL THE STATE DETERMINES WHAT CAUSED CONTAMINATION. (FROM T. AALTO R.VI, 4/15/85).
	Citgo Petroleum Corp.*	1	1. Thickness of the confining layer continued: 70-300 ft above 30-50 ft below 2. Noncompliance actions continued: Resolution of enforcement action: remedial actions anticipated. 3. Company name: previously listed as Cities Service Oil co. 4. Permits: RCRA: LAD 008080350 Interim NPDES: LA 0005941 active UIC: WD 83-1 5. Annual volume injected: 192,855,600 g 83/00/00 198,403,800 g 82/00/00 6. 10000 TDS AT 850-900 FEET (wc)Waste Components: COMPONENTS PPM Phenols 225 Sulfides 4,359 NH3 (N) 2,223
	Rubicon Chemical Inc.	3	1. Noncompliance actions continued: Resolution of enforcement action: well workover, permitted 83/09/20. 2. Permits: RCRA: LAD 008213191 Interior NPDES: LA 000892 preposal

ADDITIONAL NONCOMPLIANCE IN CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	Attachment
			UIC: 970922 3. Total thickness of the confining zone: 2,480 ft. 4. Annual volume injected: 35,700,000 g 83/00/00 49,980,000 g 82/00/00
		1	1. Noncompliance actions continued: Resolution of enforcement action: December 1980,effluent leakage ; well was worked over beginning of December 9,1980. 3rd qurter, 1983, well charts will be dated, annulus pressure will be kept)200 psi, unless justified to be lower. 2. Permits: RCRA: LAD 008213191 Interior NPDES: LA 000892 preposal UIC: 970920 3. Total thickness of the confining zone: 1,615 ft. 4. Annual volume injecte: 60,900,000 g 83/00/00 67,200,000 g 82/00/00 5. Major injection stream components provided by the company: Orthodichlorobenzene: 10 Chorobenzen: 11 Aniline: 1,630 Diaminodipheylmethane: 275 Nitrobenzene: 145 Dinitrotoluene: 65 Phenol: 122 Diphenylamine: 16 Toluene Diamine: 50 Propylene Dichloride: 13
	TENNECO OIL COMPANY	?	1.EARLY IN THEIR UIC PROGRAM (1983?) THIS WELL LEAKED INTO A USDW , FROM CABRA'S MEMO 3/27/85.
	Texaco Inc.	6	1. Original total depth: 3,966 ft. 2. Noncompliance actions continued: Resolution of enforcement action: totalizer installed, monitoring devices repaired, annulus pressure logged Company did not agree with this statement; however, they agreed that monitoring problems did exist. 3. Permits: Hazardous waste - federal (interim status) Hazardous waste - state (interim status - 81-GD-310-I1) NPDES: LA 0006041 Louisiana State WAter Discharge Permits: WP0088;WP0406 Federal Air Permits: PSD LA378; PSD LA420 Louisiana State Air Permits: 860;1464;1595 UIC: WDW-6 4. Annual volume injected: 43,773,072 g 83/00/00 7,067,508 g 82/00/00 (wc)Waste Components: COMPONENTS PPM Sour water

ADDITIONAL NONCOMPLIANCE IN CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	Attachment
	Witco Chemical Corporation, Gretna	1	1. Original total depth: 7,500 ft. 2. Noncompliance actions continued: wellhead does not have adequate protective barrier. RESOLUTION: Protective barrier instulled in 83/04/00. 3. Permits: RCRA code from O.S.W: LAD 065470916 RCRA: LAD 043A26006 Interim status NPDES:LA0005291 active UIC: 970959 4. Annual volume injected: 78,652,140 g 83/00/00 82,700,394 g 82/00/00 (wc)Waste Components: COMPONENTS PPM Methanol 1,000 Sulfite 2,000 TSS 50 Naphtha trace Chloride trace Heptane trace TOC 350 avg (300-400) COD 4,000 avg (3,000-5,000) BOD 1,000 Heavy Hydrocarbons 30
	Witco Chemical Corporation, Hahnville	2	1. Original total depth: 3,641 ft. 2. Noncompliance actions continued: Resolution of enforcement action: mechanical integrity has been restored and the necessary monitoring equipment has been installed. 3. Permits: RCRA: LAD 065470916 Interim;Part B due 84/12/00 NPDES: LA0005746 Interim, awaiting permit application UIC: 6581 Repermitting application in 84/04/00 4. Annual volume injected: 1,818 M BBL 83/00/00 (M=1000 ?) 1,650 M BBL 82/00/00 (M=1000 ?) (wc)Waste Components: CONCENTRATION OF WASTE CALCULATED FROM TDS (1,100) AND WATER (98.5%) ASSUMING EQUAL METALS AND ORGANICS. COMPONENTS PPM Organics 5,500 avg Metals 5,500 avg Acids 4,000 avg Water 98.5%=985,000 5. TDS ranges: 10,000-16,000; PH ranges: 4-11.
MI	Hoskins Manufacturing Co.	1	1. Noncompliance actions continued: Resolved; Hearings would be held in front of the Mineral Wells Advisory Board.

ADDITIONAL NONCOMPLIANCE IN CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	Attachment
			2. RCRA code from O.S.W.: MID 0270010812 3. Capacity: 14,000,000 GPY. (wc)Waste Components: COMPONENTS PPM Carbonates 65 Bicarbonates 200 Chlorides 600 Na 1,100 Cr 7.6 Ca 5 Mg 1
	Velsicol Chem. Corp.	2	1. The annual quantity of waste generated on site will vary from an anticipated 3,000,000 gal. (12,500 tons) in 1983 to ~ 40,000,000 gal. (167,000 tons) in subsequent years (data taken from EPA permit application). *INCIDENT INVOLVING ACCIDENTAL CONTAMINATION OF FEED WITH PBB
OH	Sohio Chemical Company, Vistron	1	1. contamination noted in several monitoring wells. (wc)Waste Components: COMPONENTS PPM Organic Cyanide 400 NH4 4 avg Chloride 650 avg Total Solids 4,000 Metnacrylonitrile <22
OK	Chemical Resources Inc.	1	1. Noncompliance actions continued: Resolution: operating company crurrently operating under consent agreement. Civil action pending in district court. porting,other. 2. Actual date of initial injection not provided. 3. Operational status: intermittent 4. No. of water wells within 5 mile radius: 3 irrigation wells. (wc)Waste Components: COMPONENTS PPM Acids Alkalines Caustics Cyanide Herbicides Pesticides insecticides
PA	Hammermill Paper Co.	3	1.Injection terminated 71/05/00. 2.Non-compliance actions continued: excessive injection pressure; incompletely plugged old abandoned oil and gas wells led to contamination of ground and surface water.

ADDITIONAL NONCOMPLIANCE IN CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	Attachment
			(wc)Waste Components: COMPONENTS PPM Filtrable solids 50,000 nonfiltrable solids 225,000 Sulfate 17,500 Formate 1,250 avg Acetate 1,250 avg Chloride 250
		2	1. Injection terminated: 68/09/00. 2. Non-compliance actions continued: excessive injection pressure; incompletely plugged old abandoned oil and gas wells led to contamination of ground and surface water. 3. Injection pressure continued: reduced to 1100 after acidizing (wc)Waste Components: COMPONENTS PPM Filtrable solids 50,000 non-filtrable solids 225,000 Sulfate 17,500 Formate 1,250 avg Acetate 1,250 avg Chloride 250
		1	1. Injection terminated 71/05/00. 2. Non-compliance actions continued: excessive injection pressure; incompletely plugged old and abandoned oil and gas wells contaminated surface and ground water. (wc)Waste Components: COMPONENTS PPM Filtrable solids 50,000 non-filtrable solids 225,000 Sulfate 17,500 Formate 1,250 avg Acetate 1,250 avg Chloride 250
TX	Browning - Ferris Industries	1	1.HIGH INJECTION PRESSURES MAY BE DUE TO CHANGE IN THE SPECIFIC GRAVITY OF THE WASTE INJECTED. WELL HAS BEEN RECOMPLETED IN A DIFFERENT ZONE.
	Malone Service Co.	2	1. Noncompliance actions continued: well operation,monitoring and reporting. 79-11-14 no pressure on annulus; recorder pens not inking. 80/10/28 unauthorized discharge to the pond.
	SONICS INTERNATIONAL	1	1.SURFACE SPILL AS A RESULT OF THE BLOW OUT. STATE MADE THE COMPANY CLEAN UP.

WASTE CHARACTERISTICS AT NONCOMPLIANCE WELLS

State	FACILITY NAME	WELL NO.	NONCOMPL.	WASTE TYPE
AL	Stauffer Chemical Co.	3	none	organics, brine
		1	can't perform mechanicl i.test due to crimp	brine, organic
		2	none	organics, brine
AR	Great Lakes Chemical Corp., Main plant	2	annular press. leake (83/09/26);RES: remedial act.pending	organic, acid
	Great lakes chemical Corp., south plant	5	annulus on vacuum indicated leak (83/09/26);RE:pending	organic, acid
CA	Aerojet Strategic Propulsion Company	1	none on record	Inorganics
	Rio Bravo Disposal Facility	1	THE STATE WAS NOT AWARE OF THIS FACILITY INJECTING HW*	organic, inorganic, brine, acid
FL	Kaiser Aluminum & Chemical Co.	1	none*	acid, brine
	Monsanto Company	3	none	process wastewater, contaminated stoer, dilute acid*
		1	none	process wastewater, contaminated stter, dilute acid*
		2	none	process wastewater, contaminated stoer, dilute acid*
IL	Allied Chem. Co.	1	monitoring and reporting(none reported on questionnaire)	acid, organic
	Cabot Corp.	2	none	acid, silica compounds
	LTV Steel Company*	1	well construction & operation;RESOLUTION: workover	acids
	Velsicol Corp.	1	surface problems tied into injection well through permit	inorganics
		2	surface problems tied into injection well through permit	inorganics
IN	General Electric	2	monitoring and reporting	brine, organics
	Indiana Farm Bureau Cooperative	IN3	none	spent caustic and acidic wastes
	Inland Steel Company*	1	none	Inorganics, acids, brine, water

WASTE CHARACTERISTICS AT NONCOMPLIANCE WELLS

State	FACILITY NAME	WELL NO.	NONCOMPL.	WASTE TYPE
	Midwest Steel	1*	none	acid,brine,water,metal
	Pfizer Mineral and Pigment Co.	1*	Hydrochloric spill 82/04/09	organic
	United States Steel Corporation	IN9	none	acid,brine,water
KS	Sherwin Williams	2	none	metals,brine
		3	none	metals,brine
	Vulcan Materials Co.	4	none	organics, inorganics
		3	none	organics, inorganics
		7	none	organics, inorganics
		8	none	organics, inorganics
		9	none	organic, inorganic
KY	E.I. Dupont De Nemours & Co.	1	none	acid
		2	none	acid
LA	American Cyanamid Co.	1	monitoring and reporting*	acid,organic
		2	monitoring and reporting	organic,acid
		3	monitoring and reporting	acid,organic
	Arcadian Corporation*	1	NA	acid
	BASF Wyandotte Corporation	D-1	none	acid
	Borden Chemical Co.	1	monitoring and reporting	organic,acid
		2	monitoring and reporting	organic,acid
		3	monitoring and reporting	acid,organic
	Browning-Ferris Industries (CECOS)	1	monitoring and reporting; casing leak (1982, corrected)*	organic,metals,brine
	Chevron Chemical Co.	2	monitoring records, inconsisitency in annulus pressure	organics,acid,water
		3	monitoring records; inconsistency in annulus pressure	water,organics,acid
	Citgo Petroleum Corp.*	1	well operation,monitoring and reporting*	organic,brine,acid
	E. I. Dupont,Laplace	7	none	organic,brine
		4	none	organic,brine,inorganics
		3	None	organic,brine,inorganics
		2	none	organic,brine,inorganic
		1	annulus monitoring	brine,organics
	Ethyl Corp. of Baton Rouge	1	none	acid,organics
	International Minerals and Chemical Corp.	1	monitoring and reporting	organic,acid,water
	International Minerals and Chemical Corp.	2	monitoring, reporting	oragnic,acid

WASTE CHARACTERISTICS AT NONCOMPLIANCE WELLS

State	FACILITY NAME	WELL NO.	NONCOMPL.	WASTE TYPE
	Rollins Environmental Services of LA, Inc	1	monitoring equip. not installed by 83/04/23;Resolved	organics,brine,alkaline
	Rubicon Chemical Inc.	1	monitoring and reporting*	organic
		2	monitoring and reporting	organic
		3	well operation,monitoring and reporting*	organic
	Shell Chemical Company	5	lack of inhibitor fluid in annulus	organic,acid,brine,heavy metals
		4	lack of inhibitor fluid in annulus	organic,brine,acid,heavy metals
	Shell Oil Company, East site	5	N/A	organic
		6	N/A	organic
		7	N/A	organic
		8	N/A	organic
		9	N/A	organic
		4	N/A	organic
	Shell Oil Company, West site	8	N/A	organic,acid
		2	N/A	organics,water
		5	N/A	organics,water
		6	N/A	organic,acid
		9	N/A	organic,acid
	Stauffer Chemical Company	2	none	brine*
		1	none	brine*
		3	none	brine
	TENNECO OIL COMPANY	?	USDW CONTAMINATION,CLEAN UP IN PROCESS*	
		3	Barrier posts and breaks in contiuous monitoring	organic,brine
		4	Barrier posts and breaks in contiuous monitoring	brine,organic
	Texaco Inc.	5	monitoring and reporting	acid,organic
		4	monitoring & reporting	acid,organic
		2	monitoring & reporting;Resolution:instala. of recorder	organic,acid
		1	continuous monitoring	acid,brine,organic
		6	monitoring and reporting*	acid,organic
	Uniroyal Inc.	1	none	organic,acid,brine
		2	none	organic,acid,brine
		3	none	organic,acid,brine
	Universal Oil Products	6	monitoring and reporting; Resolution: pending	acid,brine,metal,silicon
		5	monitoring and reporting; Resolution:pen	acid,metal,brine,silicon

WASTE CHARACTERISTICS AT NONCOMPLIANCE WELLS

State	FACILITY NAME	WELL NO.	NONCOMPL.	WASTE TYPE
			ding	
	Witco Chemical Corporation, Gretna	1	no apparent ID#;inconsistent monitoring equipment*	organic,brine,acid
	Witco Chemical Corporation, Hahnville	1	None	metal,acid,organic
		2	annulus - injection communication;resolved*	metal,acid,organic
MI	BASF Wyandotte	2	none	
		3	none	brine,organics,metals
	Dow Chem. Co.	2	none	organic,pesticides,metals
		4	none	organics,pesticides,brine
		8	none	organics,pesticides,brine
	Ford Motor Co., Rouge Steel	D-1	none	organics
		D-2	none	organics
	Hoskins Manufacturing Co.	1	Some incident inferred; no details available*	brine,acid,organics,metals
	Total Petroleum Inc.*	1	none	organics,acids*
		2	none	organics,acids*
	Velsicol Chem. Corp.	2	none*	brine
MS	Filtrol Corp.	1	none	acid wastewater and collected runof
NC	HERCOFINA	17 A	SUSPECTED USDW CONTAMINATION-MIGRATION BLACK CREEK	ORGANIC ACIDS,INORGANICS,HEAVY META
		OB 4	SUSPECTED USDW CONTAMINATION-WASTE MIGRATION BLACK CREEK	ORGANIC ACIDS,HEAVY METALS,OTHER INICS
		OB 5	SUSPECTED USDW CONTAMINATION-MIGRATION BLACK CREEK	ORGANIC ACIDS,METALS,OTHER INORGANI
		I6	SUSPECTED USDW CONTAMINATION-WASTE MIGRATION BLACK CREEK.	ORGANIC ACIDS,HEAVY METALS,OTHER INICS
OH	Chemical Waste Management, Inc.	4	well failed mechanical integrity test	varies
		5	well failed mechanical intergrity test	varies
		6	well failed mechanical integrity test	Varies
		1A	well failed mechanical integrity test	varies
		2	well failed mechanical integrity test	varies
		3	well failed mechanical integrity test	varies
	Sohio Chemical Company, Vistron	1	well shut down on 82/11/10;inj. press.?	organically bound cyanide groups

WASTE CHARACTERISTICS AT NONCOMPLIANCE WELLS

State	FACILITY NAME	WELL NO.	NONCOMPL.	WASTE TYPE
			resolved.*	
		2	contamination noted in several monitoring wells.	organically bound cyanide groups
		3	contamination noted in several monitoring wells.	organically bound cyanide groups
	United States Steel Corporation	1	none	organics,brine
		2*	communication to annulus	organics,brine
OK	American Airlines Inc.	1	failed mechanical integrity test;RE:pending 83/11/9.	cyanide,metals,solvents
		2	none	Metals,Inorganic
	Chemical Resources Inc.	1	well construc.,operation,monitoring and reporting*	acid,brine,pesticides,organics
	Rockwell International	1	personnel training records incomplete	alkaline,acid,organics
PA	Hammermill Paper Co.	3	fractured confining zone*, fluid leak	pulping liquor
		2	fractured confining zone*, fluid leak	pulping licuid
		1	fractured confining zone*, FLUID LEAK	pupling liquior
TX	Amoco Oil Co.	3	none	organic,brine,spent caustic
		2	exceeded permitted inj. rate for 6 consecutive months	organic,sour water,spent caustic
		1	none	brine,organic,sour water,spent caus
	Arco Chem. Co., Lyondale plant	1	none	organic
		2	none	organic
	Badische Corp.(Dow Badische Co.)	2	none	Aqueous,organic
		1	none	aqueous,organic
	Browning - Ferris Industries	1	THIS WELL PLUGGED UP,HIGH INJECTION PRESSURES*	
	Celanese Chemical Co.,Clear Lake plant	1	none	organic,acid,metals
	Champlin, Soltex & ICI, Corpus Christi Petro	2	none	organic,caustic
	Champlin, Soltex & ICI, Corpus Christi Petro	1	none	caustic,organic

WASTE CHARACTERISTICS AT NONCOMPLIANCE WELLS

State	FACILITY NAME	WELL NO.	NONCOMPL.	WASTE TYPE
	Chaparral Disposal Co. (BFI)*	1	none	acid, brine, pesticides, herbicides, or
	Disposal Systems, Inc.	1	none	organic, acid, brine, pesticides, metal stic, scrubber waste
	E. I. Dupont, Beaumount	2	none	organic, acid, brine, mineral, metals
		1	none	organic, acid, brine, minerals, metals
	E. I. Dupont, Houston plant	1	none	acid, organic
		2	none	acid, organic
		3	none	organic, acid
	E. I. Dupont, Ingleside	3	none	alkaline, sodium hydroxide
		2	none	alkaline, sodium hydroxide
	E. I. Dupont, Sabine River works	8	none	organic, acid, metals
	E. I. Dupont, Victoria	7	none	acid, brine, organic
		8	none	acid, brine, organic
		9	none	acid, brine, organic
		1	none	organic, inorganic
	Empak, Inc.	1	exceeded inj. rate in 1981.	organic, acidic, metals, inorganic, was l solvent
	General Aniline and Film Corp.	2	none	organic, inorganic
		3	injected rate exceeded MAX on 82/11/23.	organic, inorganic
		1	none	organic, inorganic
	Malone Service Co.	2	*	organic
	Merichem co.	1	none	brine, organic
	Monsanto Co.	1	none	organic
		2	none	organic
	Phillips Chemical Co.	D-2	none	brine
		D-3	none	brine
	Potash Co. of America Division	1	calibration of flow totalizer high (not "0" with no flow)	acid
	Shell Chemical Co.	1	none	organic, brine
		2	none	organic, water, brine
	SONICS INTERNATIONAL	1	WELL BLOW OUT*	
		2	WELL BLOW OUT, SURFACE SPILL, SURFACE CLEAN UP	
	Velsicol Chemical Co.	2	VIOLATION OF PH LIMITATIONS, USDW CONTAMINATION	Organic
		3	pH VIOLATION CAUSED THE CORROSION OF WELL, USDW CONTAMINAT	organic, metals, acid

WASTE CHARACTERISTICS AT NONCOMPLIANCE WELLS

State	FACILITY NAME	WELL NO.	NONCOMPL.	WASTE TYPE
	Witco Chemical Co.,Houston	2	out of compliance on injec. & annulus press. & recording	acid,organic,brine

SECTION 10

Data on

> "Such other information as the Administrator may, in his discretion, deem necessary to define the scope and nature of hazardous waste disposal in the United States through underground injection."

OPERATIONAL STATUS AND RCRA ID FOR CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	STATUS	RCRA ID
AK	Arco Alaska Inc.	2*	pending	
		1*	ACTIVE	AKD 991281221
AL	Stauffer Chemical Co.	3	abandoned*	
		1	active	ALD 095628875
		2	active	
AR	Ethyl Corp.	1	active	ARD 052528809
	Great Lakes Chemical Corp., Main plant	2	active	ARD 043195429
	Great Lakes Chemical Corp., South plant	3X	active	
		4	active	ARD 000022186
		5	abandoned t	
CA	Aerojet Strategic Propulsion Company	1	ACTIVE*	CAD 0087013850
	Rio Bravo Disposal Facility	1	ACTIVE *	CAD 000629501
CO	SHELL OIL COMPANY		PLUGGED*	
	U.S. CORP. OF ENGINEERS AND CHEMICAL CORP.		SHUT-IN*	
FL	Kaiser Aluminum & Chemical Co.	1	active	FLD 004106811
	Monsanto Company	3	activeI	FLD 071951966
		1	active	FLD 071951966
		2	active	
IL	Allied Chem. Co.	1	active	ILD 005463344
	Cabot Corp.	2	active	
		1	activeI*	ILD 042075333
	LTV Steel Company*	1	activeI	ILD 000781591
	Velsicol Corp.	1	activeI	
		2	active	ILD 000814673
IN	Bethlehem Steel Corporation, Burn Harbor Plant	2*	active	003913423
		1*	active	IND 003913423
	General Electric	2	abandoned*	
		1	abandoned*	IND 006376362
	Hoskins Manufacturing Co.	1	Active	IND 980615678
	Indiana Farm Bureau Cooperative	IN3	activeI*	IND 044908663
	Inland Steel Company*	2	ActiveI	
		1	active	IND 005159199
	Midwest Steel	1*	active	IND 016584641
	Pfizer Mineral and Pigment Co.	1*	abandoned t	
		2*	abandoned t	
	Uniroyal Inc. *	1	abandoned	IND 079561742
	United States Steel Corporation	IN9	activeI	IND 005444062
KS	Sherwin Williams	3	abandoned t*	

OPERATIONAL STATUS AND RCRA ID FOR CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	STATUS	RCRA ID
		2	abandoned t*	KSD 007163355
	Vulcan Materials Co.	4	active	
		3	active	
		7	active	
		8	active	KSD 007482029
		9	active	KSD 007482029
KY	E.I. Dupont De Nemours & Co.	1	active	KYD 003924198
		2	active	KYD 003924198
LA	American Cyanamid Co.	1	active	LAD 008175390
		2	active	LAD 008175390
		3	active	LAD 008175390
		4	active	LAD 008175390
		5	active	LAD 008175390
	Arcadian Corporation*	1	construction	*
	Atlas Processing Co.	1	abandoned	LAD 008052334
	BASF Wyandotte Corporation	D-1	activeI	LAD 040776809
	Borden Chemical Co.	1	active	
		2	active	
		3	active	LAD 003913449
	Browning-Ferris Industries (CECOS)	1	active	LAD 000616256*
	Chevron Chemical Co.	2	activeI	LAD 034199802
		3	active	LAD 034199802
	Citgo Petroleum Corp.*	1	active	LAD 008080350
		2	active	LAD 008080350
		4	just drilled	LAD 008080350
		3	active	LAD 008080350
	E. I. Dupont,Laplace	7	activeI	LAD 001890367
		6	activeI	LAD 001890367
		5	activeI	LAD 001890367
		4	activeI	LAD 001890367
		3	activeI	LAD 001890367
		2	activeI	LAD 001890367
		1	activeI	LAD 001890367
	Ethyl Corp. of Baton Rouge	1	active	LAD 000814137
	Georgia-Pacific Corporation	1	Inactive	LAD 057117434
	International Minerals and Chemical Corp.	1	activeI	LAD 020597597
		2	active	LAD 020597597
	Monsanto Chemical Company,Luling plant	1	active	
		2	active	LAD 001700756
	NASA, Michoud Assembly Facility*	2	shut in*	LAD 065490773*
		1	shut in*	
	Rollins Environmental Services of LA,Inc	1	activeI	LAD 000778514
	Rubicon Chemical Inc.	1	active	LAD 008213191
		2	active	LAD 008213191

OPERATIONAL STATUS AND RCRA ID FOR CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	STATUS	RCRA ID
		3	active	LAD 008213191
	Shell Chemical Company	4	activeI	
		5	activeI	LAD 003913183
	Shell Oil Company, East site	4	active	LAD 008186579
		5	active	LAD 008186579
		6	active	LAD 008186579
		7	active	LAD 008186579
		8	active	LAD 008186579
		9	active	LAD 008186579
		2	abandoned*	LAD 008186579
	Shell Oil Company, West site	8	activeI	LAD 980622104
		2	active	LAD 980622104
		5	active	LAD 980622104
		6	abandoned*	LAD 980622104
		9	active	LAD 980622104
	Stauffer Chemical Company	2	activeI	LAD 980627061*
		I	abandoned t	LAD 980627061
		3	active	LAD 980627061
	TENNECO OIL COMPANY	?	ABANDONED	
		3	active	LAd 008179707
		4	active	LAD 008179707
	Texaco Inc.	5	active	LAD 065485146
		4	active	LAD 065485146
		2	activeI	LAD 065485146
		1	activeI	LAD 065485146
		6	activeI	LAD 065485146
	Uniroyal Inc.	2	active	LAD 008194060
		3	active	LAD 008194060
		1	active	LAD 008194060
	Universal Oil Products	7	construction	
		6	activeI	
		5	activeI	LAD 057109449
	Witco Chemical Corporation, Gretna	I	active	LAD 043426006*
	Witco Chemical Corporation, Hahnville	1	active	LAD 065470916
		2	active	LAD 065470916
	Wyandotte Chemical Corporation	D-2	permitted	LAD 040776809
MI	BASF Wyandotte	1	abandoned	
		2	active	MID 048223986
		3	active	MID 048223986
	Detroit Coke Company	1	Active	099114704*
		2	Active	099114704*
		3	Active	099114704*
	Dow Chem. Co.	5	abandoned*	
		2	abandoned	
		4	abandoned	

OPERATIONAL STATUS AND RCRA ID FOR CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	STATUS	RCRA ID
		8	abandoned	MID 000724724
	E.I. Dupont,Montaque	1	abandoned*	MID 000809640
	Ford Motor Co., Rouge Steel	D-1	abandoned*	MID 087138431
		D-2	active	
	Hoskins Manufacturing Co.	1	active	MID 980567838*
	Parke Davis & Co.	2	abandoned	
		1	abandoned*	
		3	active	
		4	active	MID 006013643
	The Upjohn Co.	2	abandoned	
	Total Petroleum Inc.*	1	abandoned	MID 005358130
		2	active*	MID 005358130
	Velsicol Chem. Corp.	2	active	MID 000722439
MS	Filtrol Corp.	1	active	MSD 008149304
NC	HERCOFINA	OB 5	ABANDONED	
		I6	ABANDONED 5/69	
		17 A	ABANDONED T	
		OB 4	ABANDONED T	
OH	Armco Steel Corp.	1	active	
		2	active	OHD 004234480
	Calhio Chemical Inc.*	1	active	
		2	active	OHD 004227351
	Chemical Waste Management, Inc.	6	Active	OHD 020273819
		2	ACTIVE	OHD 020273819
		3	active	OHD 020273819
		4	active	OHD 020273819
		5	active	OHD 020273819
		1A	ABANDONED T	OHD 020273819
	Sohio Chemical Company, Vistron	1	active	OHD 042157644
		2	active	
		3	active	
	United States Steel Corporation	1	active	OHD 005108477
		2*	active	OHD 005108477
OK	Agrico Chem. co.	1	active	OKD 990695991*
	American Airlines Inc.	2	pending	
		1	active	OKD 001824564
	Chemical Resources Inc.	1	activeI	OKD 000402396
	Kaiser	1	active	
		2	active	OKD 098466568
	Rockwell International	1	active	OKD 007220262
	Somex	1	abandoned*	OKD 089771687
PA	Hammermill Paper Co.	3	abandoned	

OPERATIONAL STATUS AND RCRA ID FOR CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	STATUS	RCRA ID
		2	abandoned	
		1	abandoned	
TX	Amoco Oil Co.	5	permitted*	
		4	permitted*	
		3	activeI	TXD 008080533
		2	activeI	TXD 008080533
		1	activeI	TXD 008080533
	Arco Chem. CO., Lyondale plant	3	abandoned*	TXD 058275769
		2	active	TXD 058275769
		1	active	TXD 058275769
	Badische Corp. (Dow Badische Co.)	2	Active*	TXD 008081697
		1	active	TXD 008081697
	Browning - Ferris Industries	1	pending	TXD 000719104
	Celanese Chemical Co.	4	activeI	TXD 026040709
		1	active	
		2	active	
		3	active	
	Celanese Chemical Co., Clear Lake plant	1	active	TXD 078432457
		2	activeI	TXD 078432457
	Champlin, Soltex & ICI, Corpus Christi Petro	2	activeI	TXD 000836445
		1	activeI	TXD 000836445
	Chaparral Disposal Co. (BFI)*	1	active	TXD 091270017
	Chemical Waste Management	1	active	TXD 000761254
	CHEMICAL WASTE MANAGEMENT, INC	1	ACTIVE	TXD000838896
		2	PENDING*	
	Cominco American Inc.	1	changeover*	TXD 081715302
	Disposal Systems, Inc.	1	active	TXD 000719518
	E. I. Dupont, Beaumount	2	activeI	TXD 008081101
		1	activeI	TXD 008081101
	E. I. Dupont, Houston plant	1	active	
		2	active	
		3	active	TXD 008079212
	E. I. Dupont, Ingleside	3	active	TXD 063101794
		1	Active*	TXD 063101794
		2	activeI	TXD 063101794
	E. I. Dupont, Sabine River works	9	Active*	
		10	active	TXD 008079642
		8	activeI	TXD 008079642
		7	abandoned*	
		6	active	
		ADN3	Active*	TXD 008079642
		5	active	
		4	activeI	
	E. I. Dupont, Victoria	2	active	TXD 008123317
		3	active	TXD 008123317

OPERATIONAL STATUS AND RCRA ID FOR CLASS I HW WELLS

State	FACILITY NAME	WELL NO.	STATUS	RCRA ID
		4	active	TXD 008123317
		5	active	TXD 008123317
		6	active	TXD 008123317
		7	active	TXD 008123317
		8	active	TXD 008123317
		9	active	TXD 008123317
		10	active	TXD 008123317
		1	active	TXD 008123317
	Empak, Inc.	1	active	TXD 097673149
	General Aniline and Film Corp.	1	active	TXD 044452324
		2	active*	TXD 044452324
		3	active	TXD 044452324
	Gilbraltar Wastewaters, Inc.	1	active	TXD 000742304
	Malone Service Co.	1	active	
		2	active	TXD 027147115
	Merichem co.	1	active	TXD 008106999
	Monsanto Chemical Co., Chocolate Bayou	4*	pending*	
		3	active	
		1	abandoned	TXD 001700806
		2	active	
	Monsanto Co.	1	active	TXD 00807952
		2	active	TXD 008079527
	Phillips Chemical Co.	D-2	activeI	this is not a RCRA well
		D-3	active	TXD 091263558*
	Potash Co. of America Division	1	activeI	TXD 007373913
	Shell Chemical Co.	1	active	TXD 0067285873
		2	active	TXD 0067285973
	SONICS INTERNATIONAL	1	ABANDONED	
		2	ABANDONED	
	Velsicol Chemical Co.	2	abandoned	
		1	activeI	TXD 067261412*
		3	Abandoned	TXD 067261412
	Vistron Corporation	1	Active*	
		2	active	
		3	active	TXD 000751172
	Waste-water Inc.	1	pending	TXD 000729152
	Witco Chemical Co.,Houston	2	active	TXD 065078826
		1	active	
	Witco Chemical Co.,Marshall	3	active	
		2	active	TXD 049213127
WY	WYCON CHEMICAL COMPANY		CHANGE-OVER*	

LOCATION AND STATUS OF CLASS IV WELLS*

State	Facility	Number of Wells	Status
Alabama	Sanders Bumper Plating Service Tuscumbia, Al.	1	In closure process
Colorado	Gates Rubber Co. Denver, Co.	1	In closure process
	Pueblo Chemical Co. Pueblo, Co.	1	In closure process
	Rocky Mountain Arsenal Co.	1	CERCLA clean-up site
Florida	Century Plating Miami, Fl.	1	In closure process
	Hollingsworth Solderless Terminal Co. Fort Lauderdale, Fl.	1	In closure process
	General Components, Inc. Largo, Fl.	1	In closure process
Indiana	Gemeinhardt Co. Ellicott, In.	4	Active, presently being investigated
New Jersey	Monsanto Industrial Chemicals Bridgeport, N.J.	1	Plugged May 1984
New Mexico	Anaconda Co., Bluewater Mill Disposal Well Bluewater, N.M.	1	Plugged
New York	O.W. Hubbell and Sons, Inc. Hartford, N.Y.	1	Plugged 1982

LOCATION AND STATUS OF CLASS IV WELLS, CONT.

State	Facility	Number of Wells	Status
North Carolina	Cranston Printworks Fletcher, N.C.	3	Plugged Feb. 1981
Pennsylvania	Butler Mine Tunnel Pittston TWP, Pa.	1	Plugged prior to 1981
	O'Hara Sanitation Co. Upper Merion TWP, Pa.	1	Plugged (CERCLA site)
	Paoli Car Shop Paoli, Pa.	1	Plugged April 14, 1981
	Square D. Co. Emmaus, Pa.	3	In closure process
	Stanley Kessler and Co. Upper Merion TWP, Pa.	1	Plugged 1981
	Drackett Inc. Stroud TWP, Pa.	2	Plugged Oct. 14, 1983
	Grumman Allied Industries Montgomery, Pa.	1	Plugged Nov. 21, 1981
	Hammermill Paper Co. Erie, Pa.	1	CERCLA clean-up site
Puerto Rico	Flor Quim, Inc. Patillas, P.R.	1	Plugged May 1981
South Carolina	Union Switch and Signal Co. Batesburg, S.C.	1	Plugged Nov. 1984
	Ashland Chemical Co. Columbia, S.C.	1	Plugged Jan. 1984

LOCATION AND STATUS OF CLASS IV WELLS CONT.

State	Facility	Number of Wells	Status
	Progressive Equipment Co. Simpsonville, S.C.	1	Plugged Jan. 1984
Virginia	Old Dominion Meeting Culpepper, Va.	1	In closure process
	General Organic Chemical Corp. Fredericksburg, Va.	1	In closure process

Total Number of Wells 34

* This data was received and compiled during March, 1985